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FRIEDMANN'S EJECTOR.

We give herewith an engraving which will afford an idea of some of the uses to which the ejector is applied. It is not only very simple, but one of the most effective machines within recognized limits, for raising water and conveying liquids rapidly and economically by steam, that has yet been invented, and in many instances the only one that can properly do the work.

It is applicable in a great variety of forms for raising water and other fluids from tanks, wells, ponds, mines, quarries, holds of vessels, docks, gas works, wheel pits, and it is also well adapted for conveying liquids, of various degrees of consistency, from tank to tank or floor to floor in breweries, chemical works, distilleries, sugar refineries, and other similar establishments.

In outward appearance the ejector is a cylinder of irregular form, varying in length from 6 inches to 3 feet, according to size and capacity, and in circumference proportionately to its length. There are three apertures in each machine, one for steam, one for suction, and one for discharge, that which admits steam being much smaller than either of the other two.

The sectional engraving at the top conveys a clear idea of the internal construction of these ejectors and reveals at once to the mechanical eye the secret of their power. It will be perceived that they are provided with a series of intermediate nozzles or cones, firmly fitted to the body of the ejector, by which the water from the suction pipe is admitted to the receiving chamber in successive streams.

The great utility of this arrangement (which is the vital principle of the ejector) lies just here. In the ejector the steam jet acts at first only on that portion of the incoming water which is admitted through the first nozzle or cone, so that only a comparatively small jet of steam is required to move it. This stream, propelled by the force of the steam, gives an impetus to the water entering through the second cone, and that in turn becomes a motor to the next, and so on until the last is reached. The water or liquid, accelerated in its passage through these successive nozzles or cones, as well by the force already described as by the vacuum always formed under such conditions, is carried with great velocity through the diverging pipe into the discharge pipe, with all the force and rapidity necessary to convey it to its required destination.

As a means of ejecting water in sinking shafts and crosscutting drifts these ejectors are valuable, as they can be adjusted to the work, as it progresses, by simply lengthening the piping, the slow process of keeping the water free by means of buckets or bailing out being thus dispensed with.

The lower right hand view in the engraving gives a general idea of the operation of the ejector in shallow mines or coal pits, where the depth is not more than 100 feet.

The upper right hand view shows the ejector placed on the bank of a lake, river, or pond, 10 to 15 feet above the level of the water, for raising water for irrigation and other purposes. The large central view shows the ejector as applied to the filling of locomotive tanks from a river, pond, or ditch; and the view immediately below it shows the application of the ejector as a bilge pump. In view of their complete adaptability to this kind of work, and their ability to keep ships clear of water in case of accident from shot or shell, or leakage of any kind, the French, Austrian, Russian, Italian, Belgian, and other navies have provided their men-of-war with them.

We are informed that the British navy have also adopted

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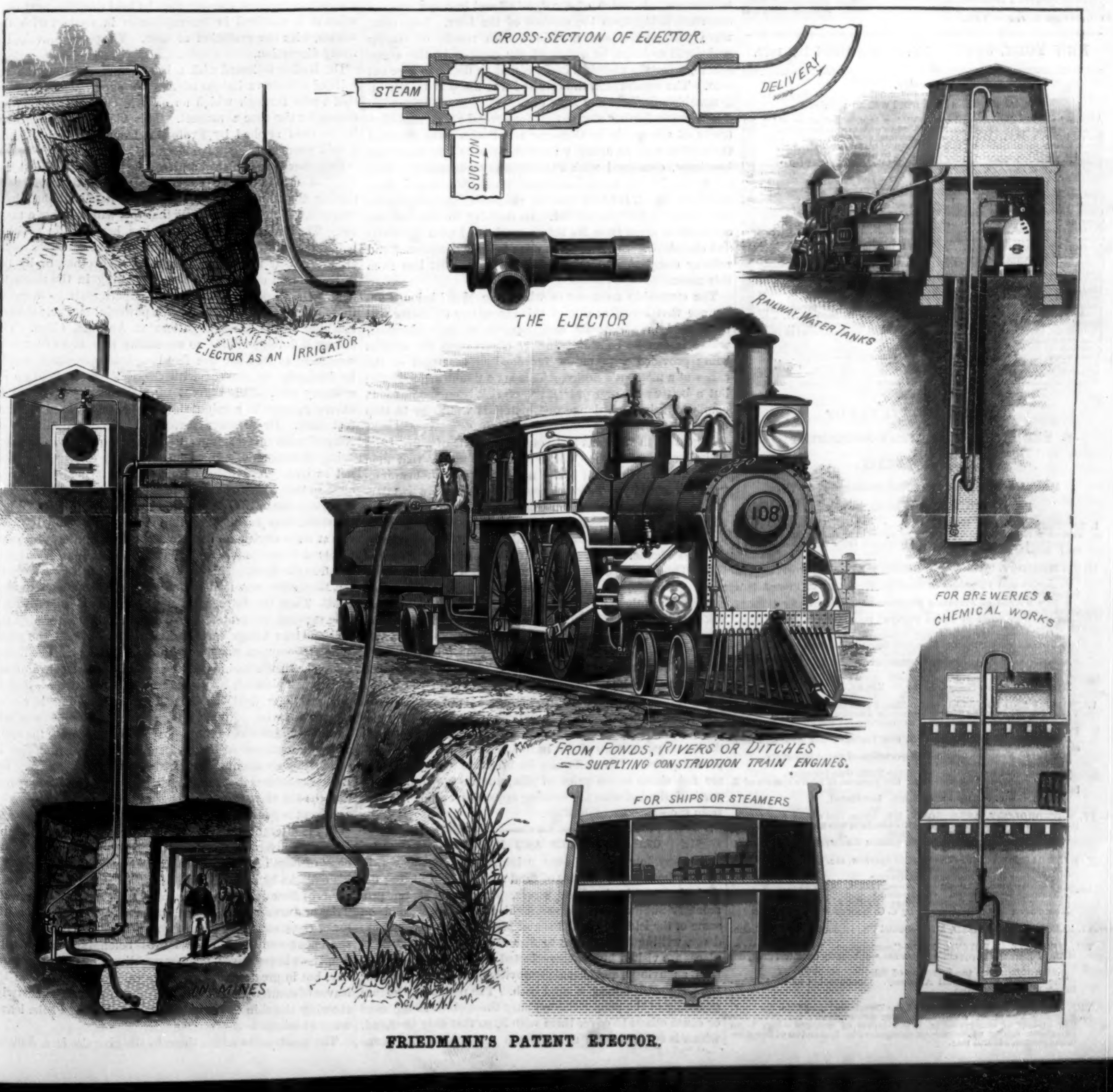

FRIEDMANN'S PATENT EJECTOR.

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NEW YORK, SATURDAY, NOVEMBER 22, 1879.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 208,

For the Week ending November 22, 1879.

Price 10 cents. For sale by all newsdealers.

INCENDIARY SILK.

The extent to which the adulteration of certain textile fabrics, notably silk and cotton, is carried in many European factories, is little suspected by the buyers of such goods, and it is only by some event outside the regular course of trade that the enormity of the practice is ever brought to light.

Thus, about a year ago, a suit brought in an English court to recover payment for sizing a quantity of cotton, revealed the extent to which that form of adulteration is carried. In the course of the trial the plaintiff was forced to explain that his process of sizing involved the loading of cotton goods with flour, clay, Epsom salts, chlorates of zinc and magnesia, and glue, to the extent of 70 per cent. He had used as high an average as 130 per cent; and he confessed that there were men in the business who loaded their goods with size as much as 230 per cent.

Silk fares even worse. The steamship Mosel, on the way from Bremen to this port, last month, mysteriously took fire in mid-ocean. Fortunately the fire was promptly discovered, and after a hard fight of five hours was put out. When the Mosel reached this city an examination was made, resulting in clear evidence that the fire spontaneously originated in certain silk goods. Samples were placed in the hands of a chemist, who reported that, under the microscope, the silk presented a remarkable appearance. The fibers ran very irregularly, and were partly covered with scales of a metallic luster, while on other fibers heavy sponge-like knots of dark color could be observed. The physical structure of the fiber seemed unimpaired. A careful chemical analysis disclosed that 100 parts of the silk were made up as follows: Moisture, 9·15; pure silken fiber, 21·35; oxide of iron, 13·45; other minerals, not determined, 3·30; fatty oils, 1·85; organic dye-stuffs and coloring matters, 50·90. The silk was free from cotton or wool fibers. For each part of fiber, 0·75 part of oxide of iron and nearly 2·50 parts of organic dyes were used for coloring. The coloring substances for this silk most probably contained tannic acids or similar substances. As much of the dyestuff and iron salt was not absorbed, it lay upon the surface of the fiber. Iron salts, when precipitated and combined with tannic or similar acids, will undergo, by action of the oxygen in the atmosphere, a certain chemical change, and in doing so give out heat. The combustion thus started was assisted by the inflammable silk fibers and fatty oils.

The report further stated that for several years manufacturers of silk goods in Germany and France have supplied the market with an article remarkable for its fine luster and heaviness, combined with extraordinary cheapness. Frequent fires in warehouses and railway cars, where such silks had been stored, led to a close investigation, and its dangerous character was discovered. Its liability to spontaneous combustion arose from its being overloaded with dyestuffs and chemicals. Steps were at once taken by insurance and railway companies to secure themselves against loss from this cause.

The steamship company to which the Mosel belongs announce that hereafter silk of this incendiary character will be stowed in a separate compartment of their steamers, where it can be constantly under observation, the officers being provided with means for flooding that part of the cargo at a moment's notice. This is no doubt a good rule; but a better and surer preventive of risk from spontaneous combustion in such dangerous materials would be to stop buying them.

A gentleman who was in Lyons at the time of a fire, from a similar cause, on the Oder, is quoted as saying that then the matter was brought to the notice of the silk manufacturers in that city. They acknowledged that there was danger from spontaneous combustion in heavily-weighted cord and sewing silk, as instances had been known of its flaming up when thrown in heaps in the factories. They, however, doubted whether there could be any danger in manufactured silk. This, after coming from the dyer, went through so many processes, that they thought all danger was worked out. The gentleman further stated that at one time sewing silk was regarded with such suspicion by the Russian authorities, that its carriage on passenger trains in Russia was prohibited. He stated that the dangerous quality in silk arose entirely from the chemicals used in the dyeing to give it weight. He knew of silk which came from the dyer's with an increased weight of over 275 per cent.

Ladies who complain that American silks do not show the brilliant luster of certain foreign brands, may now estimate the actual percentage of silk in their brilliant but brittle imported gowns. Dyestuffs may be bright of luster, but they are not cheap at the price of silk, nor are they durable or particularly desirable for wearing apparel, let alone any risk from spontaneous combustion.

ORIENTAL SAND AND MUD-BATHS.

In many low plains in the neighborhood of the sea, in Greece, immense quantities of sand are constantly being deposited from the inrolling waves, particularly at the promontory Sunium, near Missolonghi, near Corinth, and on some of the islands, as Noxos and Mykone. Professor Landerer, writing from Athens to *New Remedies*, says that these places are visited by persons affected with chronic rheumatism, anchylosis, and chronic synovitis of the knee joint, for the purpose of taking a sand bath. The patients (who are generally of the poorer classes) bury themselves in the sand or cause others to cover them with it, so that only the head, which is covered with a night cap or straw hat, remains free. It is a ludicrous sight to see twenty or thirty such odd looking heads sticking out of the sand. In consequence of the weight and the saline character of the sand, the skin of the patients becomes so red that when they emerge from their sandy bed (which they occupy as long as possible) they look like boiled lobsters. Wooden huts, or tents improvised with oleander and plantain branches, are used as bathing houses, and a piece of bread, some grapes, and a glass of wine, generally constitute the meal of a patient. Direct inquiry of the patients has elicited the fact that the effects of this sand treatment are decidedly beneficial.

Another variety of bath is likewise not uncommon, the so-called "mud bath." In the canals and ditches into which the sea water is allowed to flow, in order to obtain common salt by spontaneous evaporation, a mother water containing chiefly magnesium bromide remains behind, after the crystallized salt has been removed. At the same time, an aluminous mud collects at the bottom. This mother water, together with the mud, is used by patients affected with chronic splenitis caused by the frequent malarial fevers prevailing among the workmen in these localities, and with intestinal infarctions. The method consists in smearing the whole body with the saline mud, and in exposing themselves afterwards to the rays of the sun until the coating has become dry, when it is washed off with the saline mother water. Sometimes both the sand and the mud bath are used locally on a special portion of the body only, as, for instance, the legs or feet.

THE NATIONAL ACADEMY.

The first paper of the last day of the meeting of the National Academy was by Professor Joseph Le Conte, on the glycogenic function of the liver. It was read by Dr. George T. Barker, and was a continuation of the paper read at the previous meeting of the Academy. Dr. Le Conte contended that the chief function of the liver is in preparing sugar to be oxidized in the capillaries, whither it is carried by the blood. He regarded the liver also as a sort of storehouse for fuel; the carbon received one day may be held until the next day, when it is oxidized in the capillaries in contact with the tissues, with the evolution of heat. The paper provoked a lively discussion.

Dr. Barker followed with a brief paper detailing the results of certain variations of Arago's experiment to prove that a wire through which an electric current is passed becomes for the time a magnet. This view was overthrown by the tests applied by Professor Franklin Bache, some fifteen years ago.

Professor Bache placed a piece of cardboard against the wire in such a way as to cut the "magnetic field" containing the filings into halves. Immediately all the filings dropped. The inference was that the wire was not a magnet. The filings, it was believed, had been held in position before the interference of the cardboard in one of two ways: either by their magnetic adhesion to each other, or by the direct support of the currents circulating in the magnetic field. Dr. Barker has made some experiments to disprove these inferences. He employed a powerful magneto electric machine of the Wallace pattern at Ansonia, Conn. The energy it developed was so enormous that at a distance of seven feet an iron bar five feet long held opposite it would be instantly so charged with electricity as to hold up an ordinary nail. This current of electricity would heat to cherry redness in a minute a quarter inch gas pipe three feet long. Dr. Barker performed the "experiment of Arago" with this machine, using a copper wire. Copper, being diamagnetic, seemed not so likely to become a magnet as iron. A five inch iron spike was held below and close to this wire during the passage of the current. The spike was attracted, but not sufficiently to lift it clear. When the spike was touched to the wire, it immediately stuck fast at right angles to the wire. But when the spike was removed from the wire only the thousandth part of an inch, it fell to the floor. This showed that the great energy of the magnetism was in the wire, and not in the surrounding field. Then Dr. Barker had a glass plate prepared with a hole through its center; the wire was passed through the hole and iron filings sprinkled on the surface of the plate. When the current was passed through the wire, the filings arranged themselves in concentric circles around it. Further experiment showed, by reversing the wire current, that in this magnetic field the currents were traveling in circles around the wire. Finally, when the iron spike was held by the head parallel to the copper wire and near it, the spike deflected itself out of the perpendicular in the direction in which these currents were passing around the wire. Dr. Barker considers that his experiments yield conclusive proof that the old view was correct—that the wire through which a current is passing does become for the time a magnet.

In the afternoon, Professor J. S. Newberry, of Columbia College, delivered an essay on the vegetation of the Atlantic coast of North America in the cretaceous era, and illustrated his remarks by an exhibition of fossil leaves from the greensands of New Jersey. No angiospermic leaves appear in the Trias or Jurassic formations, but in the pottery clays of the lower cretaceous they occur in abundance. One trayful of specimens contained only leaves belonging to the salix family—willow leaves, much resembling those of the present day, but in greater variety. The other tray contained the leaves of conifers, many of them beautiful specimens; twigs showing the skin or bark; cones, etc. Some of the leaves were imbricated.

The question to which these fossils give rise is a difficult

one. They evidently are the product of a temperate, not a tropical climate. Now other fossils of the cretaceous era, such as animal remains, indicate a tropical climate for that period. These leaves are from the dawn of the cretaceous, its lower strata, and are very rich and varied. At the present day it would be difficult to find in a large space such a great number of different species of trees as are supplied in cretaceous fossils. There can now be no doubt about the position of these remains, though when the cretaceous flora of this country was first announced it was bitterly disputed. We may suppose that in the dawn of the cretaceous we had a temperate climate here; that our plants went westward and occupied Europe before the tertiary times, certainly before the miocene and the raising of the Alps. After that came the glacial epoch and destroyed that vegetation, though its traces were left in the rocks of Greenland and Iceland. After that, Asiatic flora came to Europe and replaced its vegetation.

Professor Marsh was deeply interested in Professor Newberry's paper He regarded this flora as much older than the lowest cretaceous marl of New Jersey. In that marl we have abundant crocodiles and other remains that render certain the tropical character of the cretaceous era. With regard to the fossil leaves, there had been a similar question once about certain Dakota fossils, including numerous dinosaurs, some of which were 30 feet high, and some no larger than a cat. It was now known that these Dakota fossils were Jurassic. Up to date we know of no cretaceous mammal. This is the most serious break in our palæontological record. Let us hope that in looking for these leaves we may find some mammal, large or small. Several geologists joined in the discussion at this point. Professor Marsh mentioned that he had himself picked up angiospermic leaves in Europe from undoubted cretaceous formation; these were then regarded as a great curiosity. He suggested that perhaps these leaves grew on forests near the tops of mountains, where they would have temperate climate, while it was torrid in the valleys below; and that these fossil leaves had been washed down the mountain sides and sunk in cretaceous swamps at the bottom.

A second paper by Professor Newberry gave descriptions of certain gold and silver deposits in Utah and Colorado. In the limited area which he explored of the Horn Silver Mine, in Utah, there was not less than $20,000,000 of ore in sight. Specimens of sulphate of baryta with ruby silver were exhibited. The sandstones are full of the impressions of plants; the plants themselves have been removed and the vacancies filled with horn silver. It is said that there is no parallel instance of such impregnation, but he has seen similar cases with copper ores in New Jersey.

Mines in the neighborhood of the Horn Silver Mine were almost equally rich in argentiferous galena, worth $50 to $60 per ton. Recently a similar deposit, the Silver Cliff Mine, has been found in Colorado. The district is also of archendrite rock and trachyte. A man named Bassick, a sailor, who had wandered around the world, was reduced to his last cent in this region, and was living on "tick." He picked up a mass of the rusty conglomerate rubbish, and got somebody to assay it. The yield was $50 to the ton. The chemical history of these balls of trachyte is that they were boiled and softened, when silver ore floated into their crevices or coated their surfaces. There is found silicified wood at a depth of 150 feet. Bassick proceeded to work his mine, and eventually sold out for a round $1,000,000. Silver Cliff is a hill of ore about six miles away from the Bassick mine. From another locality arsenic ores were exhibited, and it was stated that there—"the Lucky Boy's Mine"—orpiment and realgar were found in veins. The arsenic ore in some assays yielded $150 to the ton.

In his closing address Prof. Rogers dwelt upon the need of measures calculated to make the meetings of the academy more popular in character. It is not only the province of the academy to aid in research and to facilitate the progress of science, he said; it is also its duty to make its work more generally and popularly known. It is a part of the beneficence of science to extend as widely as possible the knowledge of great truths and of the advances that are made in the discovery of underlying facts and principles.

It is proper to add that in preparing our review of the proceedings of the academy we have been largely aided by the ample reports furnished by the New York *Times*.

ROADMASTERS' DIFFICULTIES.

At the first annual convention of the International Roadmasters' Association, at Niagara Falls, last September, the difficulties experienced in maintaining railway tracks were discussed by the members at great length. The proceedings are reported in full in the *Railroad Gazette*, October 10 and 17.

Mr. Wiswell said that the most difficult thing he had to contend with was sliding clay banks in the spring of the year. He had thought it might be economical to use old sleepers for retaining walls; had heard of bank walls of old ties, on the Central Vermont, which had lasted twenty years and were still in good condition.

Mr Hardy complained of fire and water. The latter occasions all sorts of trouble; sometimes it comes and takes out a culvert or bank; sometimes it soaks into clay banks, and down comes the bank on the track; and sometimes it comes under the track. He thought the New England men would bear him out in saying that with fire on the bridges, and water in the wash-outs and slides, throwing the track in many cases, they could sum up the principal part of their anxiety and trouble.

He then asked the opinion of the members as to the relative merits of gravel, stone, and other forms of ballast. Mr. Collopy thought gravel ballast the best of any; better even than furnace cinders, which were liable to break in winter. Locomotive ashes make good ballast The trouble with them, however, is the difficulty and delay of unloading cinders. He had also used rolling mill clinkers—slag, iron, and limestone.

Mr. Sullivan had tried the latter. He objected to cinders because they cause the ties to rot very fast. In locomotive cinders the ties (burr oak and white oak) play out in three or four years. In mill cinders they last as long as with gravel ballast. Touching the life of ties on the Atlantic and Great Western road, Mr. Latimer said that on the first division, where there is nothing but gravel ballast, ten years is the average; including sidings on the second division, which is also gravel ballast, but very poorly ballasted, eight years and four months; on the third, hardly better ballast, nine and one-tenth years; on the fourth, a good deal better ballast, ten years and three months. On a portion of the road, not well ballasted, very poorly ballasted indeed—that is, the third division—seven years and eight months; and in the longest part, better ballasted, eight years and two months. In another portion, where the traffic is light, eight years and five months; and where it is still lighter, with good gravel ballast, eleven years—this with chestnut ties. Mr. Kennedy thought that the more rock was put under a chestnut tie the quicker it would give out.

Mr. Hardy gave the following experience: About three or four years ago there was a piece of track laid for a change, and upon one of those tracks, about three-fourths of a mile, was sawed ties, which wear like bridge ties. He did not think the cutting up of those ties amounted to 25 per cent of the rest of the road. The track is well laid; it is a silicious country, good quartz rock, and there is no heaving. He thought that with a proper rock ballast there must be a great saving in the wear of ties and rails. Mr. Latimer had no doubt that there is more wear upon the rail resting on rock ballast or cinder ballast than there is on gravel, engine cinders, ashes, or coal dust. The ties on hard ballast are more dug into by the rail than on elastic ballast. Mr. Collopy thought there was also more wear on the rolling stock, and more broken rails in winter.

Mr. Armstrong expressed the opinion that locomotive cinders are calculated to preserve the life of some kinds of timber, and are injurious to others. In 1864 he filled a track with locomotive cinders, and used white hemlock ties. Not one per cent of those ties have been removed. He filled another track with cinders, oak ties being used, and they rotted out in five years. He used nine inches of cinders over the ballast.

Mr. Collopy expressed the opinion that the life of a hemlock tie is about three years. Mr. Sullivan said that he put down 5,000 hemlock ties in Northern Michigan, and three years after took them out with shovels. They were too rotten to pull out.

Touching the cost of maintaining a road bed in good condition, Mr. Burnett thought the yearly expense with gravel was about 40 per cent less than with broken rock. The expense of keeping rock ballast free from grass and weeds is about one-half less than with gravel. In regard to keeping a good surface on the road, Mr. Sullivan claimed that rock ballast was better than gravel, the latter being liable to settle unevenly in spring time. His choice would be: first, rock ballast; next, furnace cinders, where they could be got. Mr. Latimer preferred rock with a covering of gravel.

With reference to the heaving of the track by frost and irregular thawing, Mr. Burnett said that under certain conditions the south side of the track may heave as much as the north side. With a clay embankment stone will heave nearly as much as gravel. Stone is more open than gravel, frost penetrates further, and when the clay freezes the track will heave.

Mr. Shanks said that when eighteen or twenty inches of ballast was used there would be little freezing. But if the clay froze to any depth it was absurd to expect it not to heave. Gravel tends to keep the frost out to a certain extent. Mr. Preston suggested that imperfect drainage might be the cause of heaving. Mr. Burnett instanced a cut 250 feet long, the water running eight inches to the bottom of the ties, and there is no heaving. Mr. Wiswell spoke of a rock cut with water right up to the end of the ties, in some places the gravel would be heaved up through the track, but the ties never were out of place. Mr. Hardy's company had a rock cut with much water in it, in which 1,000 feet of new steel rails had been laid. The water gave a great deal of trouble. Mr. Burnett said he would lay 8 inch sewer pipe close to the ends of the ties and fill in with gravel He knew from experience that the method would prevent a great deal of heaving where water came from the top and had no chance to escape from the bottom. Mr. Hardy thought the pipe would not stand the temperature. They had made it a matter of much study, for they had lost a great deal of steel rail there. This on account of the rigidness of the road bed. Owing to the excessive wear in the four months of frost the life of the rails was diminished about forty per cent.

Mr. Adamson's experience was that rock is the cheapest ballast in cuts. The ties last longer, and there is less tendency to heave in winter. Another advantage was the absence of weeds and grass to attract stock. In Indiana good gravel is hard to get. He would prefer gravel if he could get it. It costs less to put in and take out ties in gravel than in rock ballast. The most perfect bed would probably be pure gravel on stone.

THE "CONCH PEARL."

Many of the readers of the SCIENTIFIC AMERICAN have doubtless frequently seen and admired the delicately tinted, pink-faced shells which are extensively used in the United States for bordering garden walks and other ornamental purposes, but few probably are aware that in the conch which forms and inhabits this shell is occasionally found a very lovely gem, known to lapidaries as the conch pearl. When perfect the pearl is either round or egg-shaped and somewhat larger than a pea, of a beautiful rose color, and watered, that is, presenting, when held to the light, the sheeny, wavy appearance of watered silk. It is, however, a very rare circumstance to find a pearl which possesses all the requirements that constitute a perfect gem, and when such does happen, it proves an exceedingly valuable prize to its fortunate finder. A good pearl is very valuable indeed, some having been sold in Nassau for no less a sum than four hundred dollars. Although many of these pearls are annually obtained by the fishermen in the Bahamas, not more than one in twenty proves to be a really good gem, and hence probably their high price.

Pink is the most common and only desirable color, although white, yellow, and brown pearls are occasionally found. Even among the pink ones there is usually some defect which mars their beauty and materially injures them; some are very irregular in shape and covered apparently with knobs or protuberances; others are too small, while many lack the watering, which gives them their great value and chief beauty.

The conch abounds in the waters of the Bahamas, and thousands of them are annually obtained and destroyed for their shells, which form quite an article of commerce, but in not one conch in a thousand is a pearl found. When this is taken into account, and the other fact, that not more than one in twenty of pearls found turns out to be perfect, it will at once be seen that a good conch pearl will always be a rare and costly gem. In fact, their value within the last few years has almost doubled, and the demand for them is steadily increasing.

Most of the conch pearls found in the Bahamas are exported to London, where they are readily sold. A few have been sent to New York, having been purchased in Nassau by an agent of Messrs. Tiffany & Co., the well known jewelers.

Like everything else that is valuable, the conch pearl has been imitated, and some of the imitations have been sold as the genuine article. Many years ago an ingenious American visited Nassau and conceived the idea of making conch pearls. He succeeded admirably in cutting out of the pink portion of the shell some very creditable imitations. To make success doubly sure, he procured a number of the live shell fish, carefully inserted his spurious pearls in the position in which the genuine pearl is usually found, and placed the fish in an inclosed place in the water. At the expiration of a month or more, the fish were again removed, and, of course, pearls found in them, several of which were sold to inexperienced persons before the fraud was detected. It was detected, however, and the perpetrator received prompt and deserved punishment. SAUNDERS.

Importance of Illustrating Inventions.

James Clerk Maxwell.

The well known Professor of Experimental Physics at Cambridge, England, James Clerk Maxwell, M.D., LL.D., F.R.S., died November 5. Professor Maxwell was an accomplished mathematician and successful investigator in physics. His "Treatise on Electricity and Magnetism," and "Theory of Heat," are his best known works.

A Great Ship enters South Pass.

The British steamship City of Bristol, Inman Line, went through the jetties October 31, drawing 24 feet 7 inches of water. The tide was four inches below the average. There was no detention whatever at the jetties or at the head of the pass. Since that date it has been announced that the largest cargo of cotton ever floated at New Orleans has safely passed outward. Now for the sanitary improvements of the Mississippi Valley, which shall permanently avert the danger of yellow fever blockades.

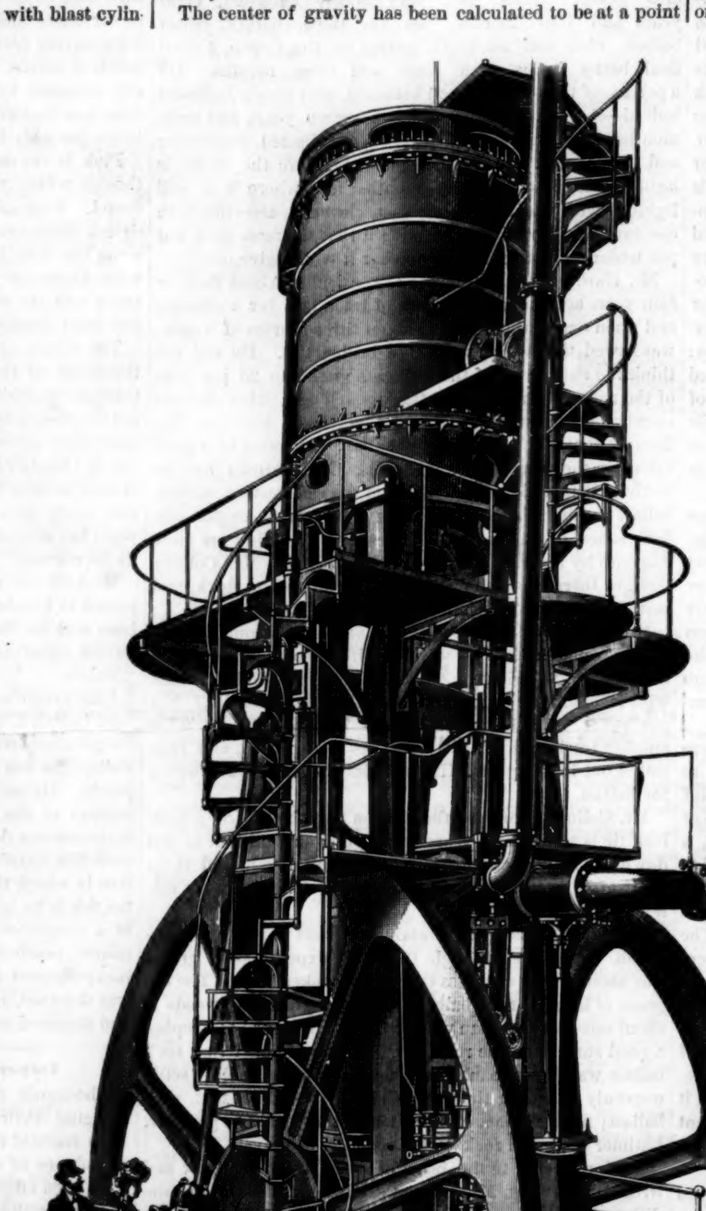
BLAST ENGINE.

The accompanying engraving represents a blast engine made by the I P Morris Company, of Philadelphia. This engine has been designed to meet the wants of American furnace managers, certain requirements having been laid down as a standard which the firm have endeavored to follow as closely as possible. These requirements are: "Completeness without sacrifice of accessibility to the moving parts, self-adjustment of parts liable to irregularities of wear, and steadiness of the whole structure and preservation of alignment by being self-contained." The first engines of this class—a pair having steam cylinders forty inches in diameter, and blast fifty-eight inches, with a stroke of four feet six inches, and producing a blast pressure of twenty-five pounds—were built about ten years ago for Bessemer steel production. Since that time a large number have been built and put into successful operation, showing that the efforts of the builders toward perfection of design have not been without their reward

The firm construct engines on this plan with blast cylinders varying from seventy-five inches in diameter and six feet stroke to one hundred and eight inches in diameter and nine feet stroke, and nearly all of them are provided with condensing apparatus sufficient for initial steam pressure of forty pounds per square inch, admitted during three fourths of the stroke, and producing a vacuum of twenty-four and one half to twenty-six inches.

The engines are fitted with the Wanich equilibrium valve. The essential feature of this valve consists in the use of a ring cast on the back of the main valve, extending upward and bored out so as to envelop and slide freely upon the outside of another ring cast on the steam chest bonnet above, extending downward and turned off evenly on the outer circumference. These rings are of course concentric, and the annular space between them is quite small, very much less than the aggregate area of the holes for the passage of steam below the pilot valve, consequently any steam passing this annular opening when the pilot is raised, goes freely through into the cylinder, exerting no appreciable pressure on the back of the main valve, and permitting it to rise easily. This has been confirmed by connecting an ordinary steam gauge with the space inclosed by the rings, showing the pressure, when the pilot was seated, to be, say, thirty five pounds, and dropping suddenly almost to zero when the pilot was raised, until the main valve opened, when it rose again to thirty-five pounds. This valve has been in use for about four years with highly satisfactory results, saving steam and proving easily manageable.

The blast valves are of selected thick sole leather, backed with plate iron, and the blast piston is fitted for either metal, wood, or bag backing. The steam piston is provided with metal double rings held out by springs. The valves are lifted by cams operating directly against rollers fitted into the bottom ends of the lifting rods, and these cams are adjustable but not variable, giving facilities for experimenting so as to determine the best distribution of steam without interference with each other. The cam shaft is driven by spur gears fitted to the main shaft. The rim of the fly wheels on the side in line with the crank pin is cored out, so that the excess of weight on the other side will counter balance the weights of piston rods, crossheads, etc. The shaft is of wrought iron, and the crosshead swivels in the yoke connecting the two piston rods, so that it may accommodate itself to any irregularities of wear in the main shaft or crank pins.



I P. MORRIS COMPANY'S BLAST ENGINE.

The engine shown in the engraving has a height of thirty-six and one half feet, weighs two hundred and fourteen thousand seven hundred and ninety-four pounds, and exerts seven hundred and fifty horse power, delivering ten thousand cubic feet of air per minute. The bed plate upon which the whole construction rests is eight feet wide and thirteen feet long, weighs seventeen thousand pounds, and is laid on a foundation of hard brick or good stone at least ten feet in depth, and well anchored to it so as to insure stability. The steam cylinder is fifty inches in diameter, and the blast cylinder ninety inches, the stroke being seven feet. The fly wheels weigh forty thousand pounds each.

The height of the engine is principally due to the length of stroke, and this has been done so that a given quantity of air can be supplied by a less number of revolutions and with fewer beats of the blast valves than is generally adopted in other engines. The direct loss in delivery, due to piston clearance and space in the passage, being a quantity depending on the diameter of the blast cylinder, then if we take a fixed diameter of cylinder it is clear that the percentage of loss of useful effect will diminish as the stroke increases. The engine is provided with a condensing apparatus situated just back of the main working parts, and in the entire construction everything has been carried out with a view to proper economy both in first construction and in future use.

Machinery for Moving Cleopatra's Needle.

Mr Charles Roebling, who designed the machinery to be used in taking down the Obelisk of Alexandria and in setting it up again when it reaches this city, describes it, in the *World*, as a special structure designed to shift the position of obelisks from a vertical to a horizontal position In taking down the monolith the first thing done will be to cover it with a casing of two inch oak planking, which will be bound at intervals of three feet with strong iron bands. This done, the obelisk will be guyed at the top from four points, like the mast of a vessel, so that there will be no possibility of its falling over.

The center of gravity has been calculated to be at a point 26 feet above the base; here will be placed trunnions on either side, which will be bolted across the sides by eight one and three quarters inch iron and four two inch steel bolts. The trunnions are historical in their way. They are cast from cannon metal only, and many of the cannon used were captured from the Confederates during the war, besides which they are the heaviest castings of their kind ever made. The trunnion plates are four inches thick, nine feet wide, and 6 feet high. At the center is the turned trunnion, which is thirty-three inches long and eighteen inches in diameter. The weight of each trunnion and plate is 1,250 lb., making them together 1¼ tons. The metal used in the casting is of the best quality, a sample taken from the same heat having broken at a tensile strength of 2,900 lb. to the square inch. It is seldom that such excellent metal has been obtained.

The next operation will be to quarry out four six inch channel ways through the base of the obelisk and insert I beams, which are to assist in raising it from the foundation.

The foundations for the towers will next be constructed. They will consist of two platforms, one on each side, of three inch oak planking, each six feet wide and twenty-four feet long. On top of these will be set four oak sticks, twelve by eighteen, firmly bolted together. The iron work of the towers will then be built on top of the preliminary foundation. This consists of one wrought iron tower placed on either side of the monolith. Each tower is made of six twelve-inch heavy wrought iron I beams, spreading out at the base to a distance of twenty-one feet and converging at the top to within five feet The beams at their base rest on four heavy I beams, and are securely riveted to the platform by means of plates and knees. Placed on top of these posts are caps, each five feet long and thirty inches wide, which are also secured by means of plates and knees. The posts are braced from top to bottom by angle and channel irons, making the towers perfectly rigid. Placed on top of the caps and securely bolted to the tower proper are cast iron journals which weigh 3,700 lb. each, forming the grooves for the trunnions to work in. A six inch rib is cast on the bottom of each of the trunnions, and in these ribs there are four two inch holes. Through each of these holes one and three-fourths inch iron rods are inserted, connecting with similar rods from the six inch I beams running through the base by means of right and left thread turn buckles, which will be used to raise the obelisk from its foundation and throw the weight on the trunnions. The foundation will then be removed and the obelisk will be left hanging free.

On account of the stone having an unknown factor of safety when supported at its center of gravity or at either end (according to some authorities as low as one and one half times), it has been deemed advisable to strengthen the stone by means of one and three-fourths inch (diameter) wire rope stays, which are run over a frame nine feet high resting on the trunnion, which is intended to be uppermost when the stone is in a horizontal position, to either end of the obelisk. The stays will relieve each end by some twenty-five tons, thus preventing any possibility of the stone cracking at its center of gravity. Having taken every precaution and got the obelisk into a free position it can then be easily turned. This will be a matter of very little exertion, provided the structure is perfectly aligned.

When the obelisk is placed in a horizontal position, Captain Gorringe, who is to have the work in charge, will next proceed to build two piles of beams placed crosswise. As soon as they reach the height of the stone jacks will be used to lift the latter out of its trunnion bearings and block it up. All the construction will then be taken away, and foot by foot the obelisk will be lowered to the ground by reducing the piles, first from one side and then from the other.

Once on the ground the obelisk will be incased in an iron cradle, which consists of a parabolic truss on each side, connected by means of heavy channel floor beams and braces. To the floor beams two heavy channel bars will be riveted, and corresponding channels will be laid on the ground to form the train for the obelisk to move on, which will be accomplished by inserting eight inch cannon balls into the grooves formed by the channel bars. The track will be laid sixty feet ahead of the cradles, so that as the stone is pushed along, the track behind will be taken up and placed in the front.

The machinery above described has been made at the works of John Roebling Sons, Trenton, N. J. The castings of the iron work were made by the Phœnix Iron Works Company, of Trenton, and the carpentering work will be done abroad. The description of the obelisk as used by Mr. Roebling to make his calculation is as follows: 67 feet 2 inches high, 8 feet 2¼ inches by 7 feet 9¾ inches wide at base, 5 feet 2 inches by 5 feet wide at top. Substance, granite; center of gravity distant from base, 26 feet; surrounding (character of) soil, sand.

The same structure, with very little difference in the manipulation, will be used to erect the obelisk when it is brought to New York.

Electrical Camphor.

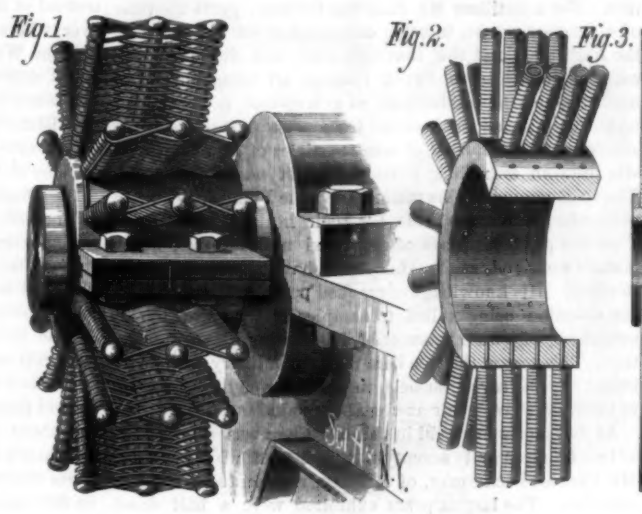
If a small bit of camphor is laid upon water it begins turning and moving about with great rapidity. If a few grains of lycopodium or other light powder have been previously scattered on the water they are drawn toward the camphor by eddies in an inverse direction. These phenomena were observed in 1748 by Romieu, who attributed them to a difference of electricity between the water and the camphor. Subsequent investigators thought they might be due to the camphor vapor striking the water and producing a recoil. M.

Casamajor has, says *Les Mondes*, resumed the study of the question and adopted the views of Romieu. He instances the following crucial experiment: At the same time that the bits of camphor are thrown upon the water insert a glass rod which has been rubbed with flannel; the motion immediately stops. If the electricity is removed from the rod by rubbing it with tinfoil, it loses its power of checking the eddies.

A NEW DEVICE FOR PREVENTING JOURNALS FROM HEATING.

It frequently happens that in spite of any amount of precaution the journals of machinery will heat and cause trouble and delay and work injury to the bearings. In many cases the difficulty may be overcome by the reconstruction of the entire machine, but this is expensive and inconvenient. The invention of Mr. James Dempsey, of Lewiston, Me., which is shown in the annexed engraving, is intended to obviate this difficulty by conducting away and dissipating the heat by means of metallic conductors, exposing a large surface to the air. Three forms of the device, all based on the same principle, are shown in the engraving. That shown in Fig. 1 consists of a copper collar fitted closely to the shaft near the bearing, and provided with a number of radial pins, around which copper wire is wound or woven so as to present a large radiating surface to the surrounding air. The temperature of the shaft can never greatly exceed that of the collar clamped upon it, and the temperature of the collar cannot become much higher than the air in which the pins and surrounding wires revolve.

In the form shown in Fig. 2, spiral copper wires are inserted in the collar to conduct away and dissipate the heat; and in the form shown in Fig. 3, metallic disks are employed as radiators instead of wires. There are, in fact, many forms in which the device may be constructed, and, as will be necessary, modify the apparatus for different applications, the inventor does not limit himself to any particular form. The device is applicable to the bearings of shafting, to car axles, to the shafts of calender rolls, and other journals liable to heating. The inventor says that in actual use it has proved very efficient.



DEMPSEY'S COOLER FOR JOURNALS.

NOVEL STEAM GENERATOR.

We give herewith an engraving of a steam generator recently patented by Mr. Charles Ward, of Charleston, W. Va., and lately tested both as to efficiency and economy on the experimental stern-wheel steamer Wild Goose, plying on the Kanawha river. We understand that the boiler easily evaporates 85 cubic feet of water per hour, with a natural draught, and supplies steam at 190 lb. pressure to an engine having a 9¾ inch cylinder and 3 foot stroke. The boiler occupies a space 7x8 feet on the deck of the boat, is 8 feet high, and has 28 square feet of grate surface; the smoke stack is 30 inches in diameter, and the weight of the boiler is only one-fourth that of flue boilers of the same capacity. Its construction is such that a perfect and rapid circulation of water is secured. The inventor claims that the effect secured in rotating boilers is secured in this without mechanical contrivances.

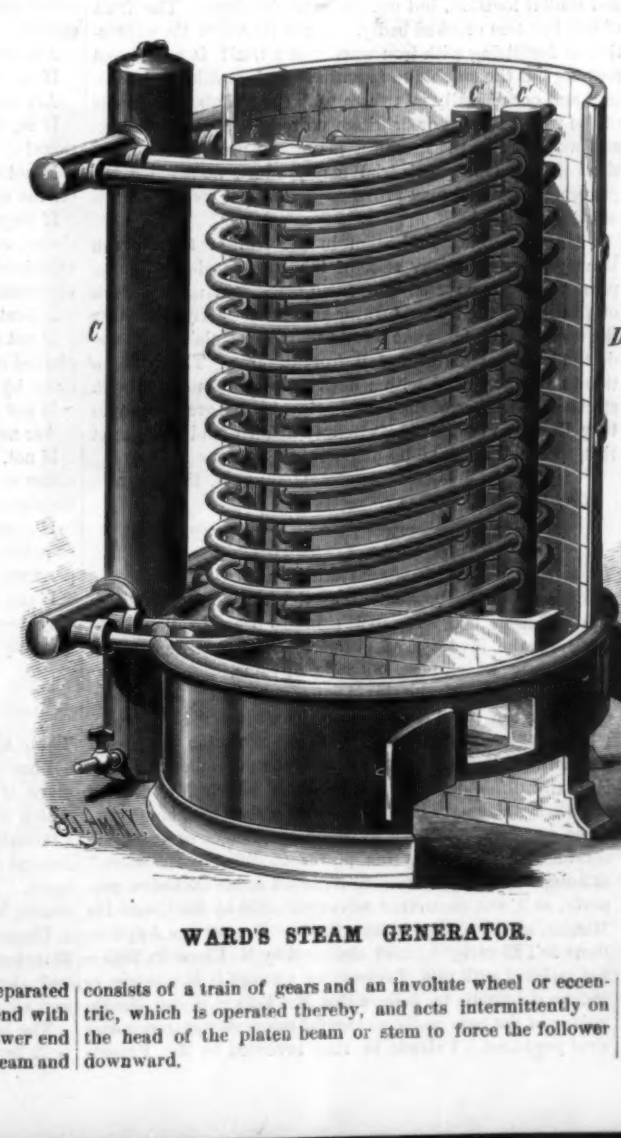
The Wild Goose is running daily, and is considered a perfect success by her projectors. The boiler has been twice inspected by the U. S. Steamboat Inspectors, and is allowed to carry 193 lb. per square inch. The boiler consists of 4 piles of 20 circular 2-inch iron tubes, the coils having respectively a diameter of 2, 3, 4, and 5 feet, all having perfect connection with each other, and by their arrangement securing compactness, lightness, a maximum of heating surface with a minimum of fuel, and practically absolute freedom from danger of explosion.

Our engraving represents a boiler having only two sets of curved tubes instead of four, but otherwise the same as that used on the Wild Goose. The connected series of curved pipes, A, are concentrically arranged and are inclosed by a concentric iron casing, D, having a firebrick lining. The inner series of pipes surrounds a vertical cylinder having a firebrick facing. The curved tubes are inclined and connected with vertical stand pipes, *c c'*, which are located on opposite sides of the boiler in line with the division wall of the fire box. The curved pipes are inclined, to facilitate the flow of water and steam toward the upper end of the stand pipes.

The flame and products of combustion pass up from each portion of the fire box in the spaces between the pipes, and between the pipes and the outer casing and the central cylinder. These firebrick surfaces reflect the heat upon the curved tubes, and this, together with the direct action of the flame and heat from the fire, insures the rapid generation of steam. The steam and water are separated by the cylinder, C, which is connected at its upper end with the upper ends of the stand pipes, *c'*, and at its lower end with the lower ends of the stand pipes, *c*. As the steam and water enter the cylinder, C, through the upper connecting pipes, the water falls while the steam is taken to the engine. A perforated diaphragm is placed across the cylinder just above the upper connecting pipes and below the engine supply pipe, to prevent the water from following the steam.

The water that falls in the cylinder returns to the boiler through the lower connecting pipes.

The stern-wheel steamer Wild Goose, upon which Mr. Ward's boiler is used, is said to be the lightest and fastest boat of its class ever built. It is 110 feet long, 16 feet beam, and 3 feet depth of hold, and draws but 16 inches. The wheel is 13 feet in diameter and 10 feet 6 inches wide. The boat has made 10 miles in 45 minutes, with a current of two miles, and it is claimed that it has no equal in stemming the chutes or rapids on shallow rivers.



WARD'S STEAM GENERATOR.

AGRICULTURAL INVENTIONS.

Mr. Moses N. Ward, of Cedar Rapids, Iowa, has patented a simple but efficient arrangement for operating the dasher of the churn. The invention consists in a short slotted lever and a long vibratory lever connected by a screw in combination with a shaft and dasher.

Mr. Will Adair, of Canmer, Ky., has patented an improved cotton and hay press for baling cotton, hay, etc., or pressing and packing other commodities. The platen is attached to a sliding beam, and the mechanism for actuating it is attached to another sliding beam, which is arranged in alignment with the platen beam, and is allowed to move downward alternately with the platen. The mechanism consists of a train of gears and an involute wheel or eccentric, which is operated thereby, and acts intermittently on the head of the platen beam or stem to force the follower downward.

Hose Pipes.

In a little pamphlet entitled "Fire Hose," the writer of which is an Englishman, and also evidently a firm believer in leather hose, we find the following:

"The history of flexible fire hose is not a long one. Its invention is claimed by two Dutchmen, both named Jan Van der Heide, who were inspectors of fire apparatus in the principal city of their country. In the year 1672 it was first publicly tried, and was found to be so successful that, within a twelvemonth, the old engines were discarded, and were replaced by new ones to work with flexible suction and delivery hoses. Five years later the Van der Heides were granted an exclusive privilege, which secured to them the right to manufacture these hoses for a period of 25 years. This hose was made in 50 foot lengths, and was coupled by brass connecting screws. We find also that at this time, besides the leather hose, pipe of sailcloth or canvas was manufactured, and that 'a seamless fabric, covered with cement or paint, was used.' Here, then, we have the canvas and woven hose which has lately been brought forward as a new invention. The reason of this is to be found in the fact that canvas hose rapidly gave way before its rival, leather, which, although it was by no means perfect, being 'sewn together like a boot leg,' and far from water tight, yet, to the mind of our forefathers, was evidently the superior of the two. It was not till 1760, eighty years after the invention, that flexible hose was introduced into this country. In 1808 copper-riveted leather hose was first made by Messrs. Sellers & Pennock, of Philadelphia; thus the honor of so great an improvement in such a valuable article belongs to an American house. Eleven years later Mr. Jacob Perkins introduced copper-riveted hose into Great Britain, and at the same time brought into use an improved coupling, which connected the hose without twisting it or diminishing the water-way, for which he was awarded a silver medal by the Society of Arts. Hempen hose, woven without seam, was made in Leipsic by one Beck, a lace weaver, in the year 1720. After this it was made by Erke, a linen weaver at Weimar; and at a later period of linen at Dresden, and also at Silesia. The canvas hose, recently introduced and flaunted before the public as something new, has been tried and abandoned 150 years ago. India rubber hose was brought out about the year 1827, by Mr. Thomas Hancock, of Fulham, and is thus the latest invented of any of the principal descriptions of hose that are in extensive use."

MECHANICAL INVENTIONS.

An improvement in plates for holding screw-cutting dies has been patented by Mr. Johan G. Geiser, of Fort Clark, Brackettville, Texas. This invention relates to hand plates for holding screw-cutting taps and dies. It consists in certain novel features by which screw threads may be more conveniently cut than heretofore, and whereby left hand taps may be formed from blanks by right hand screw-cutting devices.

Mr. Aaron T. Hammer, of Sedan, Kan., has patented an improved sewing machine motor, which consists in the combination of devices by which the vertical motion of a platform is converted into rotary motion and transmitted to the band wheel when the platform moves down.

An improvement in dumping wagons has been patented by Miss Annie McFarlane, of San Bernardino, Cal. The object of the invention is to provide a cheap, simple, and convenient dumping cart or barrow that will be especially serviceable in mines.

Mr. Benjamin F. Walters, of Norfolk, Va., has invented an improved machine for removing the stems, particles of dirt, and other adhering impurities from peanuts, and for polishing and assorting them for the market; and it consists in a peculiar arrangement of a polishing brush, and in means for rendering a picking apron detachable from the discharge end of the separator.

Mr. Daniel M. Holmes, of Arlington, N. J., has invented an improvement in the construction of the cake machines for which letters patent, Nos. 174,244 and 188,366, were granted, February 29, 1876, and March 13, 1877, respectively, to the same inventor. The object of this invention is to make the machines more convenient in use and more reliable and effective in operation.

Mr. Jackson M Rose, of Abingdon, Va., has patented an improvement in the class of beds or bodies of farm wagons which are made in sections to adapt them for extension longitudinally.

Mr. Frank W. Devine, of Carrollton, Mo., has patented an improved chain pump and curb, which consists in constructing the curb or casing above the ground in a portable shape, and in combining the suspended chain with a pipe or tube terminating at one end in a discharge spout and at the other end in a bent neck having a funnel-shaped mouth, the bend being made larger than

the other portion of the pipe and provided with an opening for admitting the water.

Mr Joseph Baker, of Lebanon, O., has invented an implement for cutting the wire bands with which sheaves of grain are bound. It consists of a blade with a hook at one end, and at the other a stock and bent lever connecting with one end of a rod on top of the blade, the other end of which has a right angular forked projection fitting over the blade, to which it is connected by pivots working in V shaped slots in the fork. On one side of the fork is a cutting bit, and on the other a clamping edge opposite a lug attached to the end of the blade. The wire being caught by the open hook, the forked projection is thrown forward, severing the wire, one end of which is caught between the clamping edge and the lug, and thus drawn from the sheaf.

Correspondence.

Protection from Lightning.—A Note from Professor Macomber.

To the Editor of the Scientific American:

Your criticism of my use of the word "practical" in the SCIENTIFIC AMERICAN of November 1, is, to a certain extent, proper. In the amount of space accorded me for reply to a correspondent it was impossible to consider the matter fully. Fearing, however, that your criticism may lead readers to deem me an advocate of the "Chambers" lightning rod, I desire to call your attention to the fact that I have denounced that rod in language which cannot be mistaken, and the company has actually commenced a suit against me for $50,000 damages in the United States Court of this State. J. K. MACOMBER.

Phys. Laboratory, Iowa Agricultural College,
Ames, Iowa, October 27, 1879.

Iron as a Fertilizer for Pear Trees.

To the Editor of the Scientific American:

It is conjectured that New Haven County, State of Connecticut, has a larger supply of choice pear trees than any other county in the United States. In the city of New Haven alone, their number increases to thousands. As the city is renowned for its noble elms and unsurpassed shade, likewise is it noted for its neat cottages and fine residences, about which are yards and gardens abounding with ornamental and fruitful vines and trees. Every owner of a lot seems to have devoted a portion to the culture of fruit. Of the large variety represented, the pear tree and grapevine are the most prominent. One gentleman has over two hundred varieties of pears growing on two separate plots of ground, embracing hardly more than 300 feet square. This number may appear to the owner of a single variety like a marvelous amount, but when placed in connection with the multitudinous number in existence, it dwindles through the comparison. It is stated that the celebrated pomologist of Europe, Dr. Van Mons, has fruited over eighty thousand varieties, which is only a small portion of the whole number produced by different individuals. This may seem incredible to those who are not acquainted with the culture of this fruit; and to those familiar with the peculiarities and capricious nature of the pear, it becomes a matter of no little surprise.

The climate as well as soil of New Haven appears to be peculiarly adapted to the culture of pears; but when the soil is examined closely it is found to be composed mainly of sand with a small proportion of iron, which is a needed requisite for stimulating the growth of the tree and fruit. When we take this fact into consideration, we are led to expressions of surprise at the success met with in this particular branch of pomology. There are bounds, however, to the successful culture of pears, as varieties have failed, in nearly all instances, of proving profitable. Of this number the most prominent is the Flemish Beauty and White D'Oyene. The latter, however, is now hardly known in this section, although it flourishes well, it is said, in the West; while the former, on account of the poor success attending the ripening of its fruit, is looked upon with disfavor. None were able to give any cause for this failure, and it was therefore with no very great hopes of ascertaining the cause and finding a remedy that I early in the season commenced making this variety something of a study.

In pursuing the study I have considered the manner of cultivation and nature of the fertilizers used, also position of the trees, and have selected three or four upon which to remark. The first to be mentioned is a standard, some fifteen feet in height and between twenty-five and thirty years of age, growing near a farmhouse a short distance from the city. The tree is sheltered upon the west, north, and south, but not upon the east. The ground is turfed and receives no fertilizer. This tree blossomed and set full, but the pears commenced early to crack, and none ripened. The second tree is a dwarf, notwithstanding the nature of the Flemish Beauty is a standard, growing in the western portion of the city. It is some twenty years old and not over ten feet high. It stands within eight feet of a high close board fence, and about it on the other sides stand trees of different varieties that produce excellent fruit. The ground about the tree is cultivated and fertilized from a compost heap. The tree blossomed full last spring, and the indications were promising for a superior crop until the pear had reached the size of an average Sickle, when they commenced cracking. At that time there was a sufficient quantity on the tree, had they matured, to make about two bushels of pears, but in place of gathering that amount but one ripe Flemish Beauty was plucked from the tree. All of the others had cracked, a very few had prematurely ripened and dropped off, in all furnishing not a dozen good ripe pears.

The third tree is one belonging to Henry Hale (Henry Hale & Co, carriage builders), and growing near Mr Hale's house, situated in the lower or eastern portion of the city. The tree is a standard of a very thrifty growth, about twenty five years old, and as many feet in height It is protected on the south by his dwelling, the north by standards of different variety and the carriage factory; east and west by adjoining gardens. The ground is turfed save a circle about four feet in diameter around the tree. Within this space the earth is kept loose and free from weeds or other vegetation. For a fertilizer Mr Hale has for many years used one of a peculiar nature, it being composed of the sweepings of the smith shop and the shavings, dust, and dirt from the room in which the woodwork is made, all being burned in one heap, and the residue used as a fertilizer, it being well mixed with the earth about the trees The sweepings of the smith shop is comprised of many particles of iron varying in size from an iron filing to that of a half ounce in weight. The trees treated in this manner, and the Flemish Beauty in particular, are remarkable for their healthy appearance This tree produces pears of great and unusual size, which mature well, and, as Mr. Hale states, have never been known to crack. His knowledge of cracked pears was acquired by his attention being called to samples shown him by his neighbors, who were unsuccessful in raising Flemish Beauties. This season the tree bore the extraordinary crop of between six and seven bushels, the largest weighing from ten to twelve ounces, a fair average being nine ounces.

At the county fair held in this city there was a collection of two hundred and seventy-five plates, of which number Mr. Charles Dickerman, of this city, represented sixty-four varieties. The largest pears exhibited were a half dozen Napoleons; next came the Dutchess. The Flemish Beauty was represented by only three or four plates, of which Mr. Hale took the first premium; the nearest approaching his in size being very much smaller.

The conclusion I have reached regarding the cause of failure in crops of Flemish Beauty is to attribute it to the lack of iron in the soil. This is based upon the success met with by Mr. Hale in the culture of his trees, representing quite a variety, all of which excel in size and quantity of fruit. It cannot be ascribed to the virtue of the ashes, as the residue from each burning remains as an accumulation to the pile, gradually increasing its size for several months before a sufficient quantity to warrant its removal has been heaped together. The ashes are meantime leached by rains, and their strength is exhausted. The particles of iron do not so readily waste their strength, but when corroding enter into the ashes, enriching them with its changed form and becoming a suitable ingredient for nourishing the roots and trees. This conclusion is strengthened by considering, in connection with this tree, one growing upon the opposite side of the street from Mr. Hale's ground. It has the advantage of the same soil and similar location, but not the same fertilizer. The fruit of this last tree cracked badly. Is not therefore the suggestion of fertilizing with iron worthy of a trial? It would cost nothing but the trouble to procure some iron filings or drillings and occasionally mix them with the soil about the roots of the tree. Filings or drillings corrode the most readily, and would prove the speediest manner of producing the desired effect. One year's trial may produce no decided improvement; several may prove no better; yet we consider it worthy of a trial.

There is another indication in the fruit of the Flemish Beauty of an unhealthy state of the tree, consisting in the pears becoming covered with small black spots; and a lack of vitality by the leaves turning and falling early. Neither the spots nor blotches are found upon Mr. Hale's fruit, nor do the leaves prematurely fall from the tree. The fruit on this tree is possessed with a dark green skin, marked with streaks or blotches of rust, and in ripening the green changes to yellow, the rust is more strongly defined, and the scarlet tint, so much admired by pomologists, deepens.

GEORGE A. HUBBARD.

New Haven, Conn., October, 1879.

The Blake Transmitter.

To the Editor of the Scientific American:

It is somewhat remarkable that the friends and admirers of Mr. Edison take such great pains to prove to the world that he is the inventor of every electrical instrument and contrivance which turns out to be of value.

Not satisfied with the signal defeat which Mr. Edison sustained in the great microphone controversy in Europe, where the leading scientists, without exception, supported the claim of Professor Hughes, that the microphonic action is totally different from the principle which Mr. Edison has always claimed as the basis of his carbon telephone, viz., "the property possessed by some substances of moderate conductivity of having this power modified by pressure," although even this cannot be regarded as his exclusive property, as it was discovered as early as 1856 by the Count Du Moncel, and described by him in his "Exposé des Applications de l'Electricité," and also used by M. Clerac in 1865—not satisfied with this, I repeat, an attempt is now made to induce the public to believe that Mr. Edison is also the inventor of the only really successful microphonic transmitter ever produced. I allude to that invented by Mr. Francis Blake, of Newton Lower Falls, Mass., and described in your issue under the date of November 1.

Wherein the similarity between the Blake and the Edison transmitters lies, it is difficult for one acquainted with both to say, save in the fact that both are used in combination with an induction coil, the secondary circuit of which is a part of the main line.

I have examined Mr. Prescott's account of Mr. Edison's inertia telephone, and find it totally different, both in action and principle, from any microphone.

It appears, however, from the article in question that Mr. Edison's latest transmitter, described also in the SCIENTIFIC AMERICAN a few weeks since, is also like the "old invention," in principle. If so, it is a query why the Western Union Company did not bring out this superior instrument instead of the carbon telephone, when the latter was beaten everywhere by the Blake transmitter. The fact really is that the Western Union tried to imitate the Blake transmitter at different times since its introduction, a year since, and could never make the imitations work, simply because the Blake transmitter has a few technical points on which its success depends, and which are only known to the electricians of the National Bell Telephone Company.

Mr. Prescott states in his book, and it is found to be true in practice, that although many substances may be used as a conducting medium for varying resistances in the Edison transmitter, lampblack is the best; per contra, lampblack is not used in the Blake transmitter at all, the substance used being invariably very hard gas carbon, besides which Mr. Edison himself states in his patent 203,016, that unmixed carbon is not adapted for use in his transmitter.

The article we have alluded to as in your last issue, in its second paragraph states that there is "nothing delicate or fine about the construction" of the Blake transmitter. In the third paragraph we find the words, "this casting supports two delicate springs, etc." One of the main features in this transmitter is the delicacy of the adjustment obtained by means of the casting, which is perpendicularly across the inside of the diaphragm, and the screw in its lower end. In conclusion, I desire to say that no caviling spirit dictates these remarks, but simply a desire for justice to the Blake transmitter, its inventor, and perfecters.

Boston, October 29, 1879. T. D. LOCKWOOD.

A String of Questions.

To the Editor of the Scientific American:

Please allow me a small space in your scientific journal (which assists to educate scientists as well as the mass of your readers) to propound a few questions for philosophical thinkers to elucidate and explain.

Is there such a thing as a vacuum in a molecule of matter?

If not, is there such a thing as a vacuum anywhere outside of a molecule of matter?

If not, where is the capacity of matter for elasticity?

If there are no vacuums, or no room for movement of molecules, how do they manage to change places?

If there are vacuums (which I claim) are they not necessarily perfect vacuums, either inside or outside of molecules?

Are molecules invariably spherical in form?

If so, what occupies the interstices?

Are molecules all of the same size?

If so, how do you account for the angularity of crystallizations?

If not of the same size and density, how do you account for the even flow of electricity along a good conductor?

If they are irregular in size, shape, and density (which I claim), can the phenomena exhibited in their movements be explained on any other ground than that there are perfect vacuums either inside or outside their organism.

Is heat or caloric a principle or a result?

If not a tangibility, can its phenomena of action be explained on any other ground than a result of activity of molecules by friction?

Is not the result of friction electricity?

Are not heat and electricity identical?

If not, explain the different results of the excitation of either as molecules of electricity or molecules of matter in the abstract?

If a cake of Northern lake ice will thaw or melt a portion of polar ice, by the activity of molecules adjusting the temperature, is the result heat or electrical activity?

If the force of heat or electrical activity can be measured, why does combustion produce such unequal results by same quantity in each different substance?

H. S. B.

A Small Steamboat.

To the Editor of the Scientific American:

I have been interested in several descriptions you have given of small steam yachts, and as I have lately built one which is (with one exception perhaps) the smallest recorded, I thought you might like to know of it, as there is now a general interest in the subject of small cheap steam pleasure boats. You will notice the results I get with a very small engine by having a light boat and high pressure.

The total length of boat is $15\frac{1}{4}$ feet; beam, $4\frac{1}{4}$ feet; depth 22 inches; built of $\frac{5}{16}$ inch cedar, lap joint on $\frac{3}{4}$x$1\frac{1}{4}$ oak ribs, and sheathed inside. Total weight with flagpoles, awning, etc., about 400 pounds (without boiler, etc.).

The boiler is made of a piece of lap-welded boiler flue, and is 12 inches diameter and 34 inches high (upright), with 40

$\frac{3}{4}$" seamless brass tubes, and is provided with steam and water gauges, whistle, etc. Engine is upright, with reverse link motion, having a cylinder 2 *inch bore by 3 inch stroke;* runs at about 200 per minute, under a pressure of 100 pounds in boiler. Propeller is 16 inches, 3 blades on a 1 in. shaft, coupled to engine with universal joint. The pump takes water from outside or the bilge box, and will throw into boiler or over side of boat. Total weight of boiler, engine and shaft, wheel, etc., 400 pounds. About three scuttles of coal are used in 10 hours' steaming. On still water I get a speed of 5 to 6 miles an hour, or with the tide about 8. The total cost of the boat was less than $230, including machinery, etc.

Yours very truly, FRED. F. SMITH.

Bridgeton, N. J , October.

Curious Facts Concerning the Cochineal Insect in the Canary Islands.

To the Editor of the Scientific American:

It is well known that these islands are the great producing market for the insect dye cochineal, giving perhaps seven-eighths of the earth's product. Therefore it naturally falls under one's notice both in its cultivation and its preparation for market. The birth is brought about by placing the madres (mothers) in a kind of hot house, and spreading them out thinly on shallow wooden boxes. The insect, as it thus appears, may be likened to a grain of wheat just taken from a pool of dirty water, as it is about that size and shape, but of a dark lead color. It has neither head, legs, nor arms, and shows no signs of life. Yet after being in the warm room a short time they begin to give forth their young.

These, to the inexperienced eye, seem to be little white specks, as devoid of life as the mother. On close examination, however, they are found to be endowed with life and activity, and have their head and arms or legs as well formed and distinct as other insects.

The mother continues to give birth for some days. Some insects are said to give as many as 800 young ones, but they invariably die when they have brought forth their progeny.

The young ones are taken to the cactus plant (which is at once their home and their sustenance) on cotton cloths, to which they adhere when the cloths are spread over the shallow boxes. These cloths are sometimes covered in a few moments, so rapidly does the parent give birth, and some one has to be with them constantly for removing the full cloths and replacing fresh ones. The cloths seem to be covered with a white powder, but the cochineal grower knows that they are the basis of his yearly earnings, and has them sent out at once to the cactus, to which the cloths are fastened by a small thorn which grows on the same plant.

Once attached to the plant the insect forsakes the cloth, and adheres to (or burrows slightly in) the plant. It soon becomes stationary, begins to grow, and assumes the characteristics of its parent, that is, loses all signs of animation, drops all its members, and becomes a part and parcel, as one may say, of the plant.

It seems to "shuffle off its mortal coil," and appears as inert and inanimate as the cactus. Notwithstanding this apparent lifelessness, they are as sensible to heat and cold as other insects. Every year the proprietor suffers more or less loss from the extreme heat sometimes felt here. This heat comes from the great Sahara Desert, and causes death to the insects by asphyxia. Early in July there were a few days of this weather, which, it is said, destroyed at least one third of the crop. I can readily believe this, as the insects had just been "planted," or put upon the cactus; and the younger they are the more sensitive they seem to these changes of the weather. They are, however, liable to loss this way as long as 30 or 40 days after being placed on the plant, and when near to maturity.

The heat kills or stops growth, the insect dies, and drops from the cactus on receiving the slightest touch of wind or other weather. The most remarkable point concerning this specimen of the animal world is, that the foregoing *only refers to the females*, as the male is a creature entirely distinct in its form and habits and mode of life.

The males are very scarce in comparison with the number of females, some assert in the proportion of one to one hundred thousand. The male has wings and flies from plant to plant, with a body like an ant. These visits from plant to plant give for their result the operation I described at the beginning of this article, that is, the hatching of the young insect.

Now the scientific questions that arise in my mind are: 1. What kind of life is this of the female, after being placed on the plant? Is it a semi-animal, semi-vegetable life?

2. Is there any other example in nature where the proportion of the female in numbers is so much greater than the male, and where their form, habits, and life are so distinct?

3. Is there any other insect that gives direct from the body (without eggs) such great numbers of young?

Santa Cruz de Teneriffe, Canary Islands, Oct., 1879.

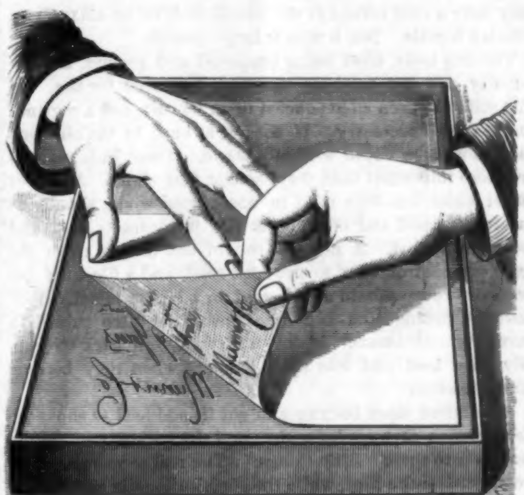
H. B. M.

ANY fibrous material can be stuck to metal, whether iron or other metal, by an amalgam composed of good glue dissolved in hot vinegar with one third of its volume of white pine pitch, also hot. This composition, it is said, will give a sure and certain result.

HOW TO WORK THE NEW COPYING PROCESS.

This process consists in transferring to a pad or tablet, composed essentially of a gelatinized solution of glue in glycerine, writings made on paper with a strong solution of one of the aniline dyes—violet or blue being generally preferred—and from this obtaining duplicate copies of the original by simply pressing sheets of paper on the transfer. The *modus operandi* of the copying is given briefly as follows:

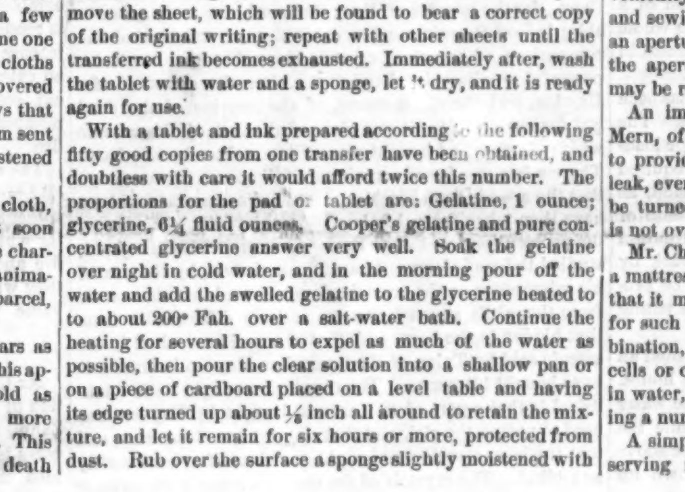
Write with a steel pen on ordinary writing paper; allow to dry; press the writing gently upon the tablet, allow it to remain a minute, when the greater part of the ink will have been transferred to the gelatinous surface, and as soon as the paper has been removed the tablet is ready to take impressions from.



NEW COPYING PAD.

Place ordinary writing paper upon the charged tablet, smoothing over with the hand, and immediately remove the sheet, which will be found to bear a correct copy of the original writing; repeat with other sheets until the transferred ink becomes exhausted. Immediately after, wash the tablet with water and a sponge, let it dry, and it is ready again for use.

With a tablet and ink prepared according to the following fifty good copies from one transfer have been obtained, and doubtless with care it would afford twice this number. The proportions for the pad or tablet are: Gelatine, 1 ounce; glycerine, $6\frac{1}{4}$ fluid ounces. Cooper's gelatine and pure concentrated glycerine answer very well. Soak the gelatine over night in cold water, and in the morning pour off the water and add the swelled gelatine to the glycerine heated to about 200° Fah. over a salt-water bath. Continue the heating for several hours to expel as much of the water as possible, then pour the clear solution into a shallow pan or on a piece of cardboard placed on a level table and having its edge turned up about $\frac{1}{8}$ inch all around to retain the mixture, and let it remain for six hours or more, protected from dust. Rub over the surface a sponge slightly moistened with water, and let it nearly dry before making the first transfer. The ink is prepared by dissolving 1 ounce of aniline violet or blue (2 R B to 3 B) in 7 fluid ounces of hot water, and, on cooling, adding 1 ounce of wine spirit with $\frac{1}{4}$ ounce of glycerine, a few drops of ether, and a drop of carbolic acid. Keep the ink in a well stoppered bottle.



PARK'S IMPROVED CABINET SEAT.

IMPROVED CABINET SEAT.

The accompanying engraving represents an improved privy seat recently patented by Mr. Edwin R. Parks, of Copper Falls Mine, Mich., and intended more particularly for school privies and those of passenger depots, railway cars, boats, hotels, and other public places.

The invention consists in a seat made alike on both sides, and pivoted at opposite edges, so that it may be turned over or reversed. The engraving shows the seat in several positions, so that its construction may be readily understood without further description.

MISCELLANEOUS INVENTIONS.

Mr. Henry R. Robbins, of Baltimore, Md., has invented an improvement in fare boxes for street cars. It consists of an inclined conduit arranged between the back of the seat and the side of the car, and having depositing throats of different lengths extending upwardly from it between the windows, the conduit having a receiving box at its lower end, where it may be inspected by the driver.

Mr. William H. Russell, of Sedalia, Mo., has patented an improved vapor burner designed for burning gasoline and other light hydrocarbons for illuminating and heating purposes. The characteristic features of this invention are a double set of horizontal curved deflecting plates, a rotary cut-off located between the two sets of plates, and opening and closing communication with an internal tube, and a surmounting generator or globular chamber located above the plates in the flame space.

An improvement in dies for forming metallic horse collar frames has been patented by Mr. Ebenezer Fisher, of Kincardine, Ontario, Canada. This invention relates to an improvement in the dies for forming metal plates into the shape required to adapt them to form the sides of a horse collar; also to an improved metal collar or collar frame, the product of the dies.

In putting up pills which are prepared with an adhesive substance or composed of deliquescent material, it has been customary to place in the box with the same a dry harmless powder of some kind, which prevents the pills from sticking to each other or to the sides of the box. This powder frequently cakes in the bottom of the box, and always in removing a pill it is impossible to avoid taking up some of the powder with the pill. Mr. Norman V. Randolph, of Richmond, Va., has patented a device designed to avoid these objections. It consists in a box with a perforated diaphragm which divides the box into two compartments, into one of which the pills are inserted, and into the other the powder may be shaken and separated from the pills when they are to be handled or removed.

Mr. Theodore L. Wiswell, of Olathe, Kan., has patented an improved harness buckle, to which straps can be conveniently and securely attached without doubling or looping and sewing in the usual way. The buckle is composed of an apertured plate, a loop and tongue. The looped ends of the apertured plate are turned outward, so that the strap may be readily inserted in the buckle

An improved faucet has been patented by Mr. John P. Mern, of New York City. The object of this invention is to provide for basins, tubs, sinks, etc., a faucet that cannot leak, even under great pressure, and that cannot accidentally be turned the wrong way and left running when its mouth is not over the basin or tub.

Mr. Charles P. Rood, of La Fargeville, N. Y., has invented a mattress adapted for use on shipboard, and constructed so that it may be used as a life-preserving raft when required for such purpose; and the invention consists in the combination, with a mattress of usual character, of watertight cells or compartments, that render the mattresses buoyant in water, and fit them for use as a raft singly or by connecting a number of them together.

A simple and effective refrigerator for cooling and preserving meats, etc., has been patented by Mr. Frederic Wolf, of Quincy, Ill. It consists essentially of a wooden refrigerating box, with a glazed cover and front, fixed between two higher ice boxes that open into it, so that the cold air from them shall descend into it.

Mr. Thomas Leach, of Taunton, Mass., has patented an improved stand for ice pitchers, which consists chiefly in a stand having an elevated support for the tilting pitcher, which stand is constructed with an opening in its surface, and a subjacent drawer adapted to catch the drip from the pitcher. The invention also consists in forming the handle for the drawer in such a shape as to make it either a support for the goblet or a receptacle into which the waste water from the goblet may be poured, and whence it passes into the drawer.

An improvement in napkins and analogous articles, patented by Mrs. Elizabeth W. M. Cameron, of Brooklyn, N. Y., consists in providing napkins, handkerchiefs, table covers, and similar articles with embroidered or printed fancy borders, which are made separately or of separate pieces, and attached to the edges of the body of the napkin or other article by a hemstitch.

Mr. Max Rubin, of New York city, has patented an improved fan of the kind that may be opened into circular form. It is so constructed that it may be closed into the space between the parts of the handle, and may be held securely in place both when opened and when closed.

An improvement in razors and knives has been patented by Mr. Nelson B. Slayton, of Rochester, N. Y. The object of this invention is to furnish razors which may be shut up and carried in the pocket without the necessity of putting them in cases.

A device for tightening wheel tires by raising or spreading the fellies so that washers may be inserted between the ends of the spokes and the felly or between the parts of the felly itself, has been patented by Mr. John A. Cooley, of Savanna, Ill.

Mr. Otis E. Davidson, of Clarksville, Tenn., has recently patented an improved paper bag machine, which is capable of rapidly and economically making satchel-bottomed bags having a single lengthwise seam or lap. The invention consists in novel mechanism for feeding and pasting, and also creasing the continuous web of paper, and for cutting off blanks therefrom, and folding, pasting, and pressing the latter, and discharging them from the machine as completed bags. A complete detailed description of the construction and operation of this machine would require engravings.

An improved centrifugal honey extractor has been patented by Mr. George W. Williams, of San Diego, Cal. The invention consists in the combination of a revolving extractor fitted with swinging comb holders and a cylindrical vessel. The shaft carries radial arms and hinged foraminous comb holders.

Messrs. Louis Rakow and Charles H. Kunke, of Gilbert's, Ill., have patented an improved machine for holding the hubs and spokes of wheels while the spokes are being driven. The invention consists in a combination of devices which cannot be clearly described without engravings.

Mr. Samuel P. McClean, of Range, O., has patented an improved metallic burial safe, which is intended to effectually prevent what is known as "body-snatching." The invention consists in a strong metallic case having a cover provided with locking devices of such a character that when once locked they are permanently locked, and can never be opened except by cutting through the heavy iron of the case. Devices are also provided which prevent the digging of the earth down to the case; and the case is secured so that it cannot be removed bodily for the purpose of gaining entrance to it through the bottom.

Mr. Richard Elliot, of Plainfield, N. J., has patented an earth auger provided with guards in the spiral groove, made fan-shaped to allow the earth to work up past them when the auger is working into the ground, and prevent its relapse as the auger is pulled out.

Mr. Henry P. Schneck, of Huntingburg, Ind., has patented an improved hay carrier which consists of a frame having wheels and sliding on an elevated rod or track, and provided with a bottom sliding plate moved by the contraction of a spring, and also having a sliding bar and clutch, the whole being arranged so that it may be moved and operated in opposite directions.

An improved truck for loading locomotive tenders has been patented by Mr. Mark A. Dees, of Scranton, Miss. The object of this invention is to construct apparatus for loading wood or coal upon locomotive tenders in the required quantity at once in place of tossing the fuel by hand, as usually practiced, thereby saving time, and, in the case of wood, packing it more closely on the tender. The invention consists in a truck adapted for being moved on a track by means of a rack and pinion, whereby one end may be projected over the tender, and fitted at its end with a tilting platform for receiving the fuel and discharging it.

Mr. Carroll J. Atkins, of Louisiana, Mo., has invented an improved elevator for putting ice from water into a house. The horizontal part of the elevator is to set into the water deep enough to allow the ice to be floated into it, while the inclined part extends up to the house to the height, or above it, at which the ice is to be packed. The ice is drawn up the incline by means of a windlass and chains or ropes.

THE CARE OF TOOLS.

We believe—although we are not certain that it is capable of demonstration—that more tools are ruined by want of care than broken or worn out by proper use. It is surprising how ready even the thoughtful workman is to leave to neglect the tool which has just subserved his purpose. Carelessness in the use of tools is a source of enormous annual expense to manufacturers and others, an expense which, if aggregated, would probably surprise even the most observant. On the farm the plow is left in the furrow, the hoe between the rows of corn, the shovel in the pit, the scythe on the tree, and the ax in the log—left to rust and to the liability of accidents. The wood-worker, called away suddenly from the job he is doing, leaves his plane on the board he has been smoothing, to be knocked off by the first passer-by, or allows the auger bit or the saw to remain in the half-pierced timber, to be broken by the first swinging board in the hands of the apprentice. The blacksmith leaves his tongs at the vise when he needs them at the anvil, and the machinist drops tap, drill, reamer, or hammer, where last used.

Order is the "first law" in the shop as in heaven, and care, no less than cleanliness, is "next to godliness." Next to the advantage of having a place for every thing is the wisdom of keeping every thing in workable condition. In the machine shop the use of impure oils in drilling, tapping, etc., is an expensive economy. Oil containing mineral or earthy matter is only a grindstone in solution. It cuts and abrades the edges of the tool, while in use, precisely as does the grindstone or buff wheel. Gummy oils are scarcely less injurious. They add to the friction of the tap or drill, and demand increased strength to resist torsion. A "gummed-up" tap or file is almost useless until thoroughly cleaned. The application of warm soapsuds, benzine, or turpentine, will not always remove this gum. In such a case they can be readily cleaned by covering them with oil, turpentine, or any inflammable substance, and exposing them for a moment to a flame until the liquid takes fire; then card or wipe them and they will be found to be in excellent order. Finishing files not unfrequently become clogged, and when the card is useless to remove the "gurry," this process will be found efficient.

Sometimes, also, in filing wrought iron the tough particles of the iron are torn off by the teeth of the file and lodge, producing scratches on the work, and thus impairing the efficiency of the tool. A simple device, which we used for years, that easily and quickly dislodges these clinging particles, is a piece of soft iron wire flattened under the hammer at one end to a chisel point, or disintegrated like a broom and used thus: The point of the file resting on the bench, the handle held by the left hand; then strike across the face of the file, in the direction of the "first cut" teeth, with the flattened end. It certainly and thoroughly dislodges the snags, and the file is ready for work. The wire instrument may have a ring turned at the handle end, or be affixed to a wooden handle. No. 8 wire is large enough.

Turning tools, after being tempered and ground, are frequently left wet from the stone until wanted for use. In this state the keen edge is acted upon by rust, and a regrinding becomes necessary. If not put at once to the oil stone they should be wiped with oily waste. These little matters are more important than they seem at first sight. A saw or chisel which has been used in unseasoned wood, should be carefully wiped and oiled, otherwise it contracts rust, and wears away fast. A new file should not be put upon the scale of cast iron or of unannealed steel, and a file kept for brass or bronze should not be used on a harder metal. Back saws for cutting iron and other metals are often ruined in inexperienced hands. If drawn forward and back too rapidly they heat and lose their temper, when they become almost useless.

A hundred other instances might be adduced to show the depreciation of tools by neglect and the necessity of paying attention to these "little things." The real economist, however, needs but a hint, while the constitutionally careless are slow to see their errors.

The Microscope in the Witness Box.

As the New York *Tribune* says, the scientific aspects of the evidence against the Rev. Mr. Hayden, of Madison, Conn., for the murder of Mary Stannard, are truly remarkable; indeed the microscopic exhibition of arsenic and the comparison of arsenical crystals show that the law has a powerful auxiliary in chemistry. After the arrest of Mr. Hayden, and the disinterment of the remains of the dead girl for examination, it was claimed that all of the arsenic which Hayden had bought was still in a box in the barn. There a box was found containing a full ounce. It was shown that the arsenic found in Mary Stannard's stomach could not have been taken from this box. At this point recourse by the prosecution was had to Prof. Dana, who visited England, studied the manufacture of arsenic, and then, by the use of his microscope on the crystals, demonstrated that the arsenic from the girl's stomach was an entirely different lot from that hidden in the barn, and that it was identical with the arsenic sold by Tyler, at the time when Hayden is known to have bought his ounce. The conclusion sought to be established is that a part of the arsenic bought by Hayden was used to poison the girl, and that the rest was flung way, and that the barn arsenic was bought elsewhere afterward merely as a blind. The crystals of the stomach arsenic are three or four times as large as those of the barn arsenic, but none of them are large enough to be visible without the microscope. Hereafter criminals will do well to recognize in science one of the agents of possible detection.

Profitable Reading.

In these days all men and women read something, but the trouble is that by reading in a single vein, which so strongly appeals to their individual tastes and personal idiosyncrasies that it is not study at all, they lose their power to study anything else. The rule for successful and profitable reading would, in the light of these facts, seem to be to read only what one does not like to read. That reading which costs no effort, and necessarily dissipates the power of study, is that which we know to be important in itself, and in its bearings upon broad knowledge and culture should most engage our time and attention. The trouble is, not that we do not read enough, but we read so much of that which simply pleases us as to destroy our power to read that which will edify and enlarge us.—*Dr. J. G. Holland.*

Probable Uses of the Telegraph.

The following curious item, headed as above, was published in the SCIENTIFIC AMERICAN, October 26, 1867, when telegraphy may be said to have been in its early infancy:

Why should not every house have its telegraph wire? When gas was first applied to purposes of illumination it was used only in the public buildings and streets, and even now on the continent of Europe it has been introduced but sparingly into private dwellings. Why may not the telegraph wire be extended and diffused—if we may say so—as the gas pipe has been? Suppose a network of such wires laid from a central point in the city to the library or sitting room of every dwelling, and an arrangement made for collecting news similar to that controlled by the associated press. Through the wires, then, this news might be instantly communicated to each family, without the work of time rendered necessary to put it into type, print it, and distribute it by means of carriers. A fire, a murder, a riot, the result of an election, would be simultaneously known in every part of the city. Of course, this would do away with newspapers, but what of that? All things have their day, and why should such ephemeral things as newspapers be an exception to the rule?

THE EJECTOR.

[*Continued from first page.*]

them after a thorough test, and after a severe competition with those of English make. Ocean and coasting steamers provided with one or more of these ejectors in each water-tight compartment would have a means of keeping clear of water until the necessary repairs could be made.

It is not sufficient to say that a steamer is provided with pumps, as it is a notable fact that pumps are almost always in a state of disarrangement, whereas there is nothing in the ejector that can get out of order or be misplaced.

The upper right hand view shows the application of the ejector to the fitting of railway water tanks, and the view below it shows its application to work in breweries and chemical works.

The ejectors are made in different ways for different purposes, and persons contemplating adopting these useful instruments should address Messrs. Nathan & Dreyfus, 108 Liberty street, New York city, for further information.

Water and Fire Proof Paper.

A water and fire proof paper lately patented is made by putting a mixture of ordinary pulp and asbestos reduced to pulp in the proportion of about two-thirds of the former to one-third of the latter into a strong solution of common salt and alum. This mixture is put through the engine and then run off through a Fourdrinier. The paper thus made is run through a bath of gum shellac dissolved in alcohol or other suitable volatile solvent of that gum, and subsequently through ordinary calender rolls, after which the paper is ready to be cut into such sized sheets as may be required for use. The effect of the strong solution of salt and alum upon the paper is to greatly strengthen it and to increase its fire-resisting qualities. The shellac bath to which it is treated is said to cause the paper to become thoroughly permeated with the gum, so the paper becomes water-proof to such an extent that long boiling in water does not disintegrate it, and the presence of the gum in and upon the surface of the paper seems to present no obstacle to the proper and usual absorption of ink, either printing or writing. Thus, by the combination of the asbestos, salt, and alum in the paper, it is rendered so far fire-proof that a direct exposure to an intense fire does not burn up the substance of the paper to an extent that interferes with safely handling it, and when exposed to great heat in books, or between metallic plates, a number of sheets together, it is much less injured by the fire.

The addition of the gum shellac to the paper makes it, for all practical purposes, water-proof, so that if account-books, valuable documents, bank bills, and other monetary papers for which this paper is used be subjected to the action of fire and water, either one or both, in a burning building, they will not be injured to such an extent as to destroy their value.

A Large Electro-Magnet.

Mr. Charles Reitz, of Indianapolis, Ind., sends us a description of a large electro-magnet made by him for Professor Zahm, of the University of Notre Dame. The length of the cores is 30 inches, diameter 4 inches. Heads, of rubber, ½ inch thick, 9 inches in diameter. The yoke is 3¾ inches thick, 6½ inches wide, and 18 inches long, with 3 inch slots to admit of moving the cores. The bolts which connect the cores with the yoke are 1¼ inches in diameter. The cores are wound with eight layers of No. 6 cotton covered copper wire, the wire being wound double, and the alternate layers being provided with terminals, which are connected with a plug switch on the baseboard, so that the electric current may be sent through the coils in various ways. The magnet is provided with two sets of pole extensions for diamagnetic experiments, one set being conical, the other flat. The armature is 15 inches long, 3 inches thick, and 4 inches wide.

Different effects may be produced in this magnet by connecting the coils with the battery in different ways. The changes that may be made in this way are almost without number. It is estimated that the magnet, with proper battery power, will lift three tons. The weight of the magnet and its attachments is 800 pounds.

The Maryland Ship Canal.

The route chosen for the proposed ship canal between Chesapeake and Delaware bays begins at Queenstown, Maryland, and runs across the peninsula to Lewes, Delaware, discharging into Delaware Bay, five miles above the Delaware breakwater; distance, 51 miles. It is proposed that the canal shall be 200 feet wide and 25 feet deep, with tide locks only. The entire line will have to be dug; estimated cost, $31,000,000. The saving in distance between Baltimore and any Northern port will be 225 miles.

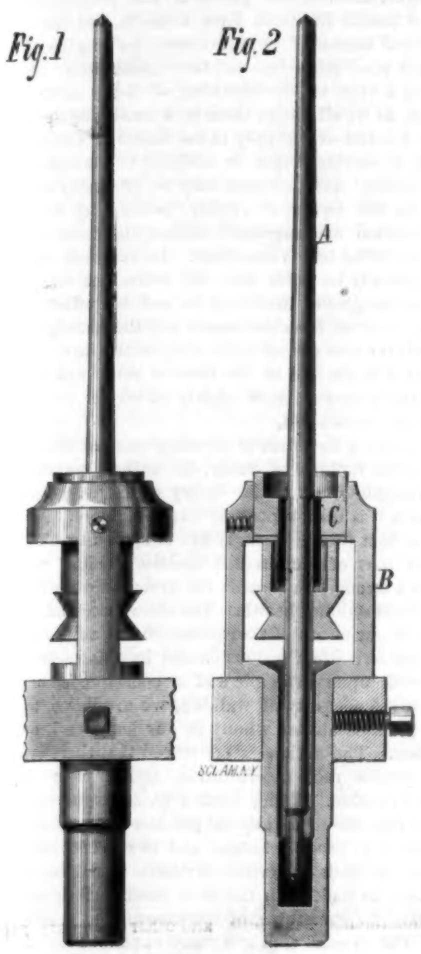
Value of Knowledge.

It is affirmed that "a little knowledge is a dangerous thing." The saying may be true, but it is not necessarily true. I cannot help thinking that it is a great advantage to you to gain as much knowledge as you can, of as many subjects as you can, and not to be deterred by any fear that your knowledge, being superficial, may lead you into error. Of course, the danger is that a person, who knows only a little of a subject, may fancy himself well qualified to give an opinion on points that are really out of his depth; but as long as a person feels and knows that his knowledge of a subject extends only so far, and does not venture beyond

his depth, that person has everything to gain and nothing to lose by getting some knowledge of it, even though the knowledge may be limited.—*Hon. W. E. Gladstone, M. P.*

AN IMPROVED SPINDLE.

We give herewith a side elevation and sectional view of an improved spindle and bolster patented by Messrs. Joseph Duffy & Henry Whorwell, of Paterson, N. J. The object sought by the inventors is to provide a bolster which will



DUFFY & WHORWELL'S IMPROVED SPINDLE.

properly support the spindle, and yet permit of readily removing the spindle and its whorl when occasion requires, and to facilitate the lubrication of the spindle bearings.

The spindle, A, revolves in its bolster, B, which is secured in a socket in the supporting rail by means of a set screw. The tubular lower portion of the bolster, together with the bridge piece that supports the upper bearing of the spindle, are formed of a single piece, and the sleeve, C, in which the spindle revolves is of the same diameter as the whorls, so that when the sleeve is loosened the spindle, together with its whorl, may be removed from the bolster. An annular oil cup is formed in the upper end of the sleeve, C, and an annular collar formed on the upper side of the whorl incloses the lower end of the sleeve, C, and returns to the bearing the oil that runs through the sleeve.

We understand that three frames, containing in all 900 spindles of this improved kind, have been built by the Danforth Locomotive and Machine Works, and are now in operation in the Watson Works at Paterson.

This spindle can be readily adapted to frames now running inferior spindles. The inventors claim that this spindle is clean, economical, free running, and substantial.

Further information may be obtained by addressing Messrs. Duffy & Whorwell, at the Danforth Locomotive and Machine Works, Paterson, N. J.

THE OTTER.

Although by no means a large animal, the otter has attained a universal reputation as a terrible and persevering foe to fish. Being possessed of a very discriminating palate, and invariably choosing the finest fish that can be found in the locality, the otter is the object of the profoundest hate to the proprietors of streams and by all human fishermen. It is so dainty an animal that it will frequently kill several fish, devouring only those portions which best please its palate, and leaving the remainder on the banks to become the prey of rats, birds, or other fish-loving creatures

For the pursuit of its finny prey the otter is admirably adapted by nature. The body is lithe and serpentine; the feet are furnished with a broad web that connects the toes, and is of infinite service in propelling the animal through the water; the tail is long, broad, and flat, proving a powerful and effectual rudder by which its movements are directed; and the short, powerful legs are so loosely jointed that the animal can turn them in almost any direction. The hair which covers the body and limbs is of two kinds, the one a close, fine, and soft fur, which lies next the skin and serves to protect the animal from the extremes of heat and cold, and the other composed of long, shining, and coarser hairs, which permit the animal to glide easily through the water The teeth are sharp and strong, and of great service in preventing the slippery prey from escaping.

The color of the otter varies slightly according to the light in which it is viewed, but is generally of a rich brown tint, intermixed with whitish-gray. This color is lighter along the back and the outside of the legs than on the other parts of the body, which are of a paler grayish hue. Its habitation is made in the bank of the river which it frequents, and is rather inartificial in its character, as the creature is fonder of occupying some natural crevice or deserted excavation than of digging a burrow for itself. The nest of the otter is composed of dry rushes, flags, or other aquatic plants, and is purposely placed as near the water as possible, so that in case of a sudden alarm the mother otter may plunge into the stream together with her young family, and find a refuge among the vegetation that skirts the river banks. The number of the young is from three to five, and they make their appearance about March or April.

On account of the powerfully-scented secretion with which the otter is furnished by nature, it is readily followed by dogs, who are always eager after the sport, although they may not be very willing to engage in single fight with so redoubtable an opponent. An otter has been known to turn savagely upon a dog that was urged to attack it, to drag it into the water, and to drown it. The best dogs for the purpose are said to be the otter hounds. Even human foes are resisted with equal violence.

The fur of the otter is so warm and handsome that it is in great request for commercial purposes. The entire length of the animal is rather under three feet and a half, of which the tail occupies about fourteen or fifteen inches. On the average, it weighs about twenty-three pounds; but there are examples which have far surpassed that weight. Mr. Bell records an instance of a gigantic otter that was captured in the river Lea, between Hertford and Ware, which weighed forty pounds.

THE OTTER.—*Lutra Vulgaris.*

NEW BARREL LIFTER.

It is difficult to conceive of a more ungainly and inconvenient object to handle than a common barrel. It is very well calculated for rolling about on a level surface, but when it is desired to lift it from one level to another, as from the ground into a wagon, for example, or carrying it up and down steps or stairs and through narrow passages, it is quite a difficult matter

BROWN'S BARREL LIFTER.

The engraving shows a device, the invention of Mr. William Brown, of 65 Java street, Greenpoint, L. I., which is intended to facilitate the handling of barrels. It is a very simple and efficient contrivance, and is adapted to barrels of different sizes. It consists of two pairs of triangular castings, A, each pair being connected by a handle, B, and a curved iron or steel bar, C, at the top, and the iron hoop which surrounds the barrel passes through mortises in the lower arms of the castings and is held in place by set screws. The hoop may be adjusted to barrels of different sizes by loosening the set screws and sliding the ends of the hoop one way or the otherthrough the castings.

The manner of applying the lifter will be clearly understood by referring to Fig. 1 in the engraving. An upward strain upon the handles puts a lateral strain upon the hoop, and brings the curved bars, C, against the side of the barrel with sufficient force to admit of lifting it by the handles. A patent is pending for this invention in the United States Patent Office. Further information may be obtained by addressing the inventor as above.

NATURAL HISTORY NOTES.

Ferns and their Uses.—The beautiful plants belonging to the order of ferns, although mostly collected and cultivated for ornamental purposes, have some economic and medicinal uses, although perhaps not very important ones. The male fern (*Aspidium filix mas*) and the marginal shield fern (*A. marginale*) are used as a valuable remedy for tape-worms; and an African species (*A. athamanticum*), as well as the female fern (*Asplenium filix fœmina*), the dwarf spleenwort (*A. trichomanes*), the wall-rue fern (*A. ruta-muraria*), the hart's-tongue (*Scolopendrium vulgare*), the common brake (*Pteris aquilina*), and a few others, are regarded as having the same properties, and have been used for the same purposes. The common polypody (*Polypodium vulgare*) was formerly regarded as a cholagogue, and was given in head diseases. The flowering fern and cinnamon fern (*Osmunda regalis* and *Cinnamomea*) are regarded as demulcent, sub-astringent, and tonic, and the former yields a fine mucilage useful in summer complaints.

Several species of moonworts (*Ophioglossum* and *Botrychium*) were formerly regarded as vulneraries. Some species of maidenhair (*Adiantum*) have feeble, aromatic, demulcent properties, and are used for forming the sirup called "capillaire." A Peruvian species of *Polypodium* has some reputation in fevers and other maladies; and the down from the stem of some *Cibotium* has been much recommended as a styptic, under the name of Penghawar Djambi—its action being probably merely mechanical, as chemical analysis has shown no active principle. A similar substance is gathered in Madeira from *Dicksonia culcita* to stuff cushions. The rhizome of *Phymatodes leiorhiza*, when dry, smells and tastes like licorice. A small species of *Grammites*, of Peru, is so odoriferous when dry that it is used by the Indian women as an agreeable perfume. The long creeping rhizome of a variety of the common brake (*Pteris aquilina*) was formerly much used for food in New Zealand. It abounds in starch and mucilage; but if this variety is no more palatable than our own, it is very undesirable food. The rhizome of our own variety of the brake when roasted has a slimy consistence and disagreeable taste and odor. If the rhizome, however, after being washed and peeled, is scraped so as to avoid including the hard walled tissue, and then mixed with a sufficient quantity of water, the mucilage will be dissolved, and after a few hours may be decanted. A little colorless, tasteless mucilage will pass off on a second washing, and the residue when baked is far from unpalatable, and must be very nutritious. It is in fact far better than cassava bread, and would not be despised in time of famine.

The large rhizome of *Marattia salicina* is eaten when prepared in the same way as the brake. The soft cellular substance of *Cyathea medullaris* affords a better article of food; and, for the same purpose, some other species are occasionally used. In a recent number of *La Nature* there is a note on this subject by M. P. Guyot, who says: "The majority of the ferns of our forests and woods contain starch and might be used as food. Still, it should be observed that when the plant has emerged from the soil it possesses an odor and taste which are repulsive, and which render its uses impossible. It is the same, however, with asparagus; and, like the latter, the stalks of ferns can only be directly eaten before they have grown above the soil and undergone the greening action of the sun's rays; in this state they are fleshy, white, and tender, and as to quality greatly resemble the shoots of asparagus. The principal edible species of our forest ferns is the male fern, and the commonest is the one that resembles a little palm tree. A well known landscape painter reckons among his claims to glory the invention of fern-shoot omelets. In France, however, the consumption of fern-shoots is very limited, and they are eaten only out of simple curiosity. Not so in Japan, for during the spring and summer season the inhabitants of the high clayey mountains derive almost the whole of their food supply from ferns, which they call warabi. In the spring they eat the young fronds, and later on they consume the starch that they extract from the rhizomes. The preparation of this is very simple. They begin by washing the roots to remove the earth, then crush them with a mallet, and afterward stir up the *débris* in water contained in reservoirs hollowed out of tree trunks. The water containing the starch is then drawn off into other reservoirs placed beneath and allowed to settle. By this means the amount of starch obtained is about 15 per cent of the weight of the rhizomes employed. Every hamlet has a special place assigned for this operation; and the products of these washings form large masses there that testify to the importance of this manufacture. It is to insure the reproduction of these ferns that the inhabitants, every two or three years, burn the herbs and underbrush, which spring up in the shade of the oaks and chestnuts."

Several ferns, when burnt, produce ashes useful for manure, or as crude matter for the chemists.

Simulation of Death by Insects.—In an interesting paper read not long ago before the Entomological Society of England, the simulation of death so freqently observed among insects was regarded not as an intentional stratagem to escape danger, but as a species of catalepsy due to terror, and was compared to the so-called fascination which certain birds and small mammals experience in presence of a snake. It would seem that the tendency to such simulation in different species is inversely as their locomotive powers. Thus, as far as the true insects are concerned, shamming death is most common among the coleoptera, the order whose locomotive faculties are upon the whole lowest. Looking again at the different groups of coleoptera, we find the tendency to simulate death absent, or at least very rare, among the tiger beetles, carabs, and the geodephaga generally; among the long-horns, which, when alarmed, rise in the air almost as readily as do bees or diptera; among the staphylini, which both fly, run, and fight well, and among the elateridæ, which escape danger by a sudden leap. On the other hand, the semblance of death is often put on by the lamellicornes, which are slow crawlers, blundering fliers, and are incapable of taking wing without some time for preparation. All these properties are still more decided in the genus *Byrrhus*, and here accordingly we find simulation at its height. At the mere sound or vibration caused by an approaching footstep, human or brute, one of the latter insects draws in its legs and assumes very effectively the appearance of a small stone or rounded clod of earth. Among spiders the same distinction may be traced. The slower and more sedentary forms, if in presence of a powerful enemy, roll themselves up in a ball, and may easily pass unobserved. On the contrary, the wandering ground spiders, such as the *Lycosæ*, which in warm weather bound with such rapidity that they are sometimes by careless observers supposed to fly, rarely resort to this stratagem except when very persistently teased and intercepted.

The Origin of our Domestic Animals.—Palæolithic man, who existed for so long a period in Western Europe during the quaternary age, was probably indigenous there. But at the commencement of the neolithic age a new civilization was suddenly introduced, and a new type of man appears upon the scene. Neolithic man, with his polished stone implements, brings with him a number of domestic animals—the dog, the goat, the sheep, the ox, the horse, and the pig. By studying the origin of these animals, and determining their ancestral home, light may obviously be thrown upon the source whence the neoliths emigrated. Such a study has been undertaken by Professor Gabriel de Mortillet, who has contributed an interesting paper on this subject to the current number of M. Cartailhac's "Materials for the History of Man." Neolithic man, according to the author, came from Asia Minor, from Armenia, and the Caucasus. These, in fact, are said to be the only countries which could have yielded the assemblage of domestic animals and cereals which the neoliths brought with them upon their invasion of Southwestern Europe during the Robenhausen period.

A Remarkable Spider's Web.—A writer in *Nature* says: A large spider, of a genus common all over Polynesia, and also in New Caledonia (where formerly much eaten by the aborigines) produces a very strong, thick web. On Sundays, generally, when no work is going on in the plantations, the imported Pacific Islanders amuse themselves by wandering about the bush, armed with a framework of cane in the shape of an elongated cone, affixed to a long stick. This they twist and twist, round and round in the spider's webs, till it is coated sometimes half an inch thick with the viscous fabric. They then untie the fastenings and draw out the strips of cane, when the bag becomes like a long old-pattern night-cap. I have one before me now, over a yard long, a foot across, and pretty thick, which does not weigh one ounce! It is yellow; the New Caledonian ones are usually gray. Some of the New Caledonian ones are stretched tight enough to resemble an Indian suspension "tom-tom," and really emit a slight sound on being tapped.

The Fertilization of Red Sea-Weeds.—The agency of insects in securing the due fertilization of many flowering plants has been much written about, and is now well understood. In a recent number of "Kosmos" Dr. Dodel Port, the eminent botanist of Zurich, has published the results of a series of observations made by him regarding the part played in the fertilization of a certain species of *Florideæ*, or red seaweed, viz., *Polysiphonia subulata*, by animalcules. He finds that certain wheel-animalcules, or *Vorticellæ*, which grow upon the sea weed, create, by means of the constant motion of their cilia, a current which bears the sperm cells—the representative of the pollen grains—from the male plant to the stigma-like end of the germ case of the female plant. The paper is of great biological importance, since it forms, so far as our knowledge extends, the first record of the participation of animals in the fertilization of cryptogams, which in itself is an interesting parallel to the relations existing between insects and phænogams.

The Correlation of Mutilation of Insect Larvæ with Deformity in the Imago.—In the *Comptes Rendus* of the Belgian Entomological Society for July, of the present year, there is a notice by M. Melise of experiments made by him to determine the effect produced on the perfect insect by mutilation of the larva. M. Melise operated upon ten selected silkworms by cutting off the right metathoracic leg of each. All went through their transformations, and the operation apparently caused little inconvenience, for they recommenced feeding again immediately afterward. The effect produced on the moths produced from these larvæ was as follows: One was deprived of three tarsal joints, but the claw was developed. Three had only the femur and tibia. One had the leg "amputated" in the middle of the femur. The two others had only a stump, scarcely a millimeter in length. The author adds that in not one of the moths was the leg absolutely absent, and that the variation in the amount of deformity probably resulted from the difficulty of performing the amputation in the larvæ at precisely the same place in each. In the case of insects with incomplete metamorphoses parallel experiments have often been made, and with similar results; but with lepidoptera they have been so few as to render confirmatory evidence of the statements of other experimenters of much value.

Macrobiotics and Eubanics.

The *Evening Post* makes a translation from a portion of an interesting little book in the German language published at Bonn, from the pen of Dr. Wilhelm Schmoele, well known in this country as a physician of eminent acquirements, which is likely to attract a good deal of attention. The work is entitled "Macrobiotics and Eubanics"—Macrobiotics being the art of prolonging life, and Eubanics being the art of walking well.

Dr. Schmoele explains, in that part of the book which relates to Macrobiotics, the germinal and progressive phenomena of human life from birth to death, and the organic and chemical nature of vital processes, seeking to discover inductively what physicians call the "indications" for treatment with a view to the checking of decay after middle life, when, as we all know, there is a constantly increasing excess of demand over supply in the matter of vitality. Dr. Schmoele is convinced that in addition to the influence of hygienic living, specific means may be profitably employed in checking this decline of vitality, postponing death from vital exhaustion, and especially adding vigor and efficiency to body and mind in advanced age. In common with physicians generally he holds that the infirmities of age come earlier and are greater than need be, and his effort has been to find in observed facts the reason and the remedy for this. He regards the free use of citric acid, in the form of lemon juice, and of lactic acid in the form of sour milk of every kind, as the remedies most plainly called for by the facts scientifically considered.

In considering the effect of certain abnormal influences in increasing the rapidity of decay, the author suggests some of the principles of a broader theory of diagnosis and treatment which it is his purpose to expound more fully to the profession in a future work, if life is spared to him.

In that part of the present treatise which relates to Eubanics a strong plea is made for systematic walking as a means of maintaining health. The abundance and the convenience of our means of transportation, the author believes, bring to modern life a serious danger in this respect. Unless we walk upon principle and in consequence of a conviction of the necessity of walking, we are liable to abandon the practice almost wholly in our haste and our self-indulgence. The author is convinced that there is danger here of serious race deterioration, and he very earnestly pleads for caution. Going further he seeks to remove the principal obstacle to the general practice of walking, namely its tendency to produce fatigue and to repel lovers of physical ease; he finds in certain rhythmic principles a means of learning to walk with the least possible fatigue, giving to the exercise something of the charm that dancing possesses. The system, which is fully explained in the book, is founded upon a study of the principles involved in dancing, and especially in the German waltz, which, as is well known, a good dancer may continue without fatigue much longer than most persons can walk with comfort, stepping with anything like equal rapidity.

Seeds.

At the last meeting of the British Association Sir John Lubbock read an interesting paper on seeds. He commenced by calling attention to the difference presented by seeds, some being large, some small, some covered with hooks, some provided with hairs, some smooth, some sticky, etc. He gave the reasons of these peculiarities, and then spoke of the modes of dispersion, by means of which seeds secured a sort of natural rotation of crops, and in other cases were enabled to rectify their frontiers. Some plants actually threw their seeds, some were transported by the wind, and many were provided with a wing which caught the wind. Dispersion was also effected by the agency of animals. This means was divided into two classes, where seeds adhered to animals by hooks, and where the same purpose was effected by sticky glands. The next point touched upon was, that seeds found themselves in spots suitable for growth. Most seeds germinated on the ground, but there were instances, as the mistletoe, where they were parasitic on trees. Such seeds were embedded in a viscid substance, so that if dropped by a bird on a bough they adhered to it. In some cases plants buried their own seeds, and in other instances the seeds buried themselves, the means by which these processes were effected being fully explained by Sir John, who, in conclusion, called attention to mimicking seeds, such as the scorpiurus, the pods of which did not open, but looked so exactly like worms that birds were induced to peck at them and thus free the seeds. That this was the purpose of the resemblance he would not assert, but he threw it out as a matter for consideration.

Alcohol by Electricity.

Berthelot's experiment was conducted as follows: "A battery of from six to eight Bunsen elements was arranged in connection with an oscillating commutator, so as to give alternately positive and negative currents twelve to fifteen times a second, to two cylinders of spongy platinum, acting as electrodes. These platinum cylinders were immersed in acidulated water, and the contacts were so arranged that neither oxygen nor hydrogen was disengaged, the water being reformed as soon as decomposed. Thus regulated, the electrodes of the apparatus were immersed in an aqueous solution of glucose." In this way alcohol was formed, although in very small quantities, but it is expected that when some improvements in the apparatus are made, the process will be much more rapid.

Openings for Industrial Enterprise in California.

The Baltimore *Sun* has in California a correspondent whose letters are always replete with practical information and good sense. In a recent communication he says: Millions for speculation, but not a dime for industry, is what is the matter with San Francisco. The leading commercial paper intimates that it is not the industry of the Chinese, but the laziness of the whites and the industrial abhorrence of capital, that causes the general prostration, and that is sure to retard our recuperation indefinitely. What California requires is a large accession of a more industrious race. We want men inclined to invest in manufactures· we want farmers, not mere wheat growers and soil robbers. But with these must come capital. There is immense overstock of capital here for gambling in stocks, cornering in merchandise, lot speculating, and for all purposes involving no industry. But for manufacturing not a dime. Our wool and hides we send 19,000 miles, via Cape Horn, to be made into cloth and shoes, and brought back to us. These, if we had New England industry and capital, we should be making at home. We send away furs and felting to be made into hats and wraps. Our agricultural machinery we import. Even soap and candles also. Though we have the best white vinegar and vegetables, we import pickles. Hogs runs wild, yet we buy hams, flitches, and lard abroad. Nearly all our coal oil is from Pennsylvania, yet we have twice as large a range of coal oil of our own. We buy vast quantities of hydraulic cement abroad, yet not excepting Portland, England, there are nowhere more nor finer materials for making it than at our Santa Cruz.

We buy all our iron and stock—an enormous amount—while iron ore, fuel, and lime are right at hand. Foreign beer and ale cost us extravagantly, while our hops and barley are far superior to all foreign growth. Even butter and cheese we import largely, to our shame. Cranberries, chiccory, hops, and oatmeal, crackers, olives, raisins, fruit-preserves, prunes, nuts, tobacco, and cotton we buy, while we have every facility for raising them here, always excepting industry Every bushel of grain we use and ship is packed in East India sacks, which we can cheaply make from our own wild textiles.

We even import foreign wines largely adulterated, while our country is covered with vineyards and our own wines are pure, wholesome, and well flavored. We could extend the list, but enough is given to show what a field there is here for profitable industry in the most genial climate in the world, and in a land literally flowing with milk and honey, and teeming with every variety of food to gladden the heart and tickle the bowels of the faithful. After this expose let no man say: "There is no chance for industry; everything is overdone." On the contrary, nowhere on this broad earth has any nation such inducements to offer to willing hands and hearts. . . . There are here mines of copper, antimony, manganese, and chrome that can be got for a song. Farmers can raise cotton, but we have no factories to buy it. Silk, also, but no reelers to buy the cocoons. Tea gardens would cover our hill lands, but there is no industry to manipulate and prepare the leaves. We have 20,000 idle hands waiting for something to turn up, grinning at all these waiting industries and wondering why other people do not go to work.

Cheiloangioscopy.

Among the most interesting sights to be viewed with the microscope is the circulation of the blood in a living frog's foot. The membrane is stretched by means of clips upon the stage of the instrument, and when the proper lenses are applied the movement of the blood may be observed rushing along with force like a mill stream.

Hitherto, says the *Nineteenth Century*, except in the case of Perkinje's experiment, in which an observer can see the circulation in his own retinal blood vessels, the evidence of circulation in the human subject has been entirely circumstantial, derived from the facts of structure of the circulatory organs, and from the manner in which the blood flows from several arteries and veins. But by means of a simple arrangement, invented by Dr. C. Hüter, of Greifswald, it is now possible to witness the actual flow of blood in the blood-vessels of another person, and that with sufficient accuracy to detect any abnormality in the circulation, and so to obtain invaluable assistance in the diagnosis of disease.

In Dr. Hüter's arrangement the patient's head is fixed in a frame, something like that used by photographers, on which is a contrivance for supporting a microscope and lamp. The lower lip is drawn out, and fixed, by means of clips, on the stage of the microscope, with its inner surface upward; a strong light is thrown on this surface by a condenser, and the microscope, provided with a low-power objective, is brought to bear upon the delicate network of vessels, which can be seen in the position indicated even with the naked eye.

The appearance presented is, at first, as if the vessels were filled with red injection. But by focusing a small superficial vessel the observer is soon able to distinguish the movement of the blood stream, rendered evident by the speck-like red corpuscles, the flow of which, in the corkscrew-like capillaries, is said by Hüter to be especially beautiful. The colorless corpuscles are distinguishable as minute white specks, occurring now and again in the course of the red stream. Besides the phenomena of the circulation, the cells of pavement-epithelium lining the lip, and their nuclei, can readily be distinguished, as well as the apertures of the mucous glands.

Besides the normal circulation, various pathological conditions can be observed By a pressure quite insufficient to cause pain, the phenomena of blood stagnation—the stoppage of the flow, and the gradual change in the color of the blood from bright red to purple—are seen. A momentary stoppage is also produced by touching the lip with ice, a more enduring stasis by certain reagents, such as glycerine or ammonia.

Hüter states that he has already proved the great use of "cheiloangioscopy," as he calls the new process, in his medical practice. The variation in the blood-flow and in the diameter of the vessels, the crowding together of the red corpuscles, the increase in number of the white corpuscles, occurring in certain diseases, all these may be observed readily and exactly. It will, indeed, be at once obvious how great is the importance of a method like this, by which an actual observation of the circulation is made possible, especially when it is borne in mind that even the rough and ready method of feeling the pulse affords a valuable indication of the state of health.

Balling's Saccharometer.

This is the instrument which is usually employed by continental brewers for testing the gravity of their worts and beers, and as it is often referred to in foreign technical papers quoted in our pages, we give a short explanation of its graduation. Balling's saccharometer is usually made of glass, with a well of mercury as a weight, in this respect resembling some of our English saccharometers; the graduation of the stem, however, is very different, as it is arranged to indicate the weight of sugar contained in 100 parts by weight of a pure sugar solution. For example, if Balling's saccharometer be placed in a solution of sugar and sink to the line marked 20, it indicates that 100 parts of the sugar solution contain 20 lb. of sugar, or, in other words, 20 per cent by weight. The degrees Balling are therefore the percentages by weight, and in this respect the instrument is very simple. In the following table we give the degrees Balling from 1 to 20, with the corresponding specific gravities of the solution, which may be useful for reference:

Degrees Balling.	Specific gravity.	Lb. per barrel.
1	1·0039	1·4
2	1·0078	2·8
3	1·0117	4·0
4	1·0157	5·5
5	1·0197	7·0
6	1·0237	8·5
7	1·0278	10·0
8	1·0319	11·5
9	1·0360	13·0
10	1·0401	14·5
11	1·0443	16·0
12	1·0485	17·5
13	1·0528	19·0
14	1·0570	20·5
15	1·0613	22·0
16	1·0657	23·5
17	1·0700	25·2
18	1·0744	26·8
19	1·0787	28·2
20	1·0832	30·0

In round numbers, each degree Balling corresponds to 1½ lb. per barrel; it must be borne in mind that the degrees Balling represent percentages of pure sugar, and not percentages of malt extract.—*Brewer's Guardian.*

Improvement in Silvering Glass.

The plan of coating mirrors with a thin film of silver, though superior to the old amalgamating process, has some drawbacks. The ordinary treatment is as follows: The glass is laid on a horizontal table of cast iron covered with a woolen cloth and heated to 40 deg. Centig. (104 deg. Fahr.) On the glass, previously well cleaned, are poured successively a solution of tartaric acid, and then another of ammoniacal nitrate of silver. Under the influence of the heat the organic acid reduces the metallic salt, and after about 20 minutes the silver is deposited on the glass in adherent layers; the whole operation does not occupy more than an hour. The mirror is then dried and the metal covered with a varnish sufficient to protect it from friction and the action of sulphur vapors, which blacken it. But silver deposited in this way often has an unpleasant yellowish reflection. M. Lenoir, of Paris, turned his attention to discovering a process which would obviate this drawback. He has succeeded by the following means. The glass, once silvered, is subjected to the action of a dilute solution of the double cyanide of mercury and potassium, when an amalgam of white and brilliant silver is formed, adhering strongly to the glass. To facilitate the operation and utilize all the silver employed, M. Lenoir, by a recent improvement, sprinkles the glass at the moment the mercurial solution is applied with a very fine powder of zinc, which precipitates the mercury and regulates the amalgamation. Mirrors thus treated no longer give, it is said, the yellowish images of the silver used alone, but the white and brilliant reflection of the old process, without the emanation of vapors which would be injurious to the men employed upon the operation.

HOW TO MEDICATE A PIG.—At a recent meeting of an English farmers' club, Prof. McBride spoke of the difficulty of administering medicine to a pig. He said: To dose a pig, which you are sure to choke if you attempt to make him drink while squealing, halter him as you would for execution, and tie the rope end to a stake. He will pull back until the rope is tightly strained. When he has ceased his uproar and begins to reflect, approach him, and between the back part of his jaws insert an old shoe, from which you have cut the toe leather. This he will at once begin to suck and chew. Through it pour medicine, and he will swallow any quantity you please.

Some Facts about Cotton.

In a recent letter Mr. Edward Atkinson, of Boston, shows by comparison of results the enormous economic superiority of free labor over slave labor, in the cultivation of cotton. The crop of cotton of 1878 and 1879 was the largest ever raised. The ten crops of 1852 to 1861, inclusive, being the last crop raised by slave labor, numbered 34,995,440 bales. The ten crops of 1870 to 1879, inclusive, being the ten last crops raised by free labor, numbered 41,454,743 bales. The excess of the ten years of free labor amounts to 6,459,303 bales. The value of the ten last crops, of which about two thirds have been exported, has been not less than $2,500,000,000, and has probably amounted to $3,000,000,000. The increase is progressive, the excess of the five last crops over the five crops immediately preceding the war has been 3,932,415 bales. . . .

The world's crop of cotton is now equal to ten to twelve million bales of the average weight of American cotton, probably the latter. Of this quantity five million bales are raised in the United States, and between six and seven million bales are spun and woven upon machinery contained in large factories in Europe and America. The rest is spun and woven by hand, and there is probably a larger portion of the population of the globe still insufficiently clothed in hand-made goods than are clothed in those furnished by the factories of Europe and America combined. The average work of one operative working one year in Lowell will supply the annual wants of 1,600 fully clothed Chinese or 3,000 partly clothed East Indians. No country in the world, except Egypt, produces any substantial quantity of cotton so well adapted to work upon modern machinery as that of the Southern States. Nearly one half the world remains to be conquered by cotton and commerce. To the cotton fields and factories of the United States will not the increase surely come as commerce slowly but surely opens the way?

The whole cotton crop of the world could be raised on a section of Texas less than one twelfth of its area; or could be divided between any two of the other principal cotton States without exhausting one half of their good lands, or it could all be raised on less than one half the Indian Territory that is not yet occupied at all.

Touching the cost of raising cotton in the South, Mr. Atkinson suggests the opinion that if the cost of labor be measured by its effectiveness as well as by the measure of the money with which it is paid, there is no place in the world where so effective an amount of manual labor can be procured at so little cost as in the employment of negroes upon our Southern cotton fields. The price of bacon and corn gauges the cost of cotton. Eaten together they are digestible and nutritious—eaten separately quite otherwise. They constitute the food that the negro field hand freely chooses. Three and one half pounds of bacon, one peck of meal, and one quart of molasses or sirup constitute the week's ration of an adult man or woman. This ration has been lately and can now be supplied at a cost of thirty-eight to forty-two cents per week, or six cents or less per day. The plat of sweet potatoes and fish from the ponds and rivers serve for the rest.

The Chicago Stock Yards.

In a report on the treatment of live stock on the railways, made by Mr. Zadok Street, to the American Humane Association, at its recent meeting, we find the following facts relative to the great stock yards at Chicago. These are the most extensive in America, probably in the world.

They have 1,000 cattle pens, 1,200 hog and sheep pens, and stabling for 1,200 horses. Fifteen hundred cars of stock can be unloaded and cared for daily. The system of railways extending into different parts of the Western States, thousands of miles, center there. They occupy 350 acres of land, and cost nearly $5,000,000. Their repairs cost about $150,000 annually, and it requires 700 men constantly employed in and about the yards to do the work required. They will accommodate about 10,000 cattle, 120,000 hogs, 5,000 sheep, and 1,000 horses at one time. The pens for hogs and sheep are covered; those for cattle are not covered.

The Way to Health.

The only true way to health is that which common sense dictates to man. Live within the bounds of reason. Eat moderately, drink temperately, sleep regularly, avoid excess in anything, and preserve a conscience "void of offense." Some men eat themselves to death, some drink themselves to death, some wear out their lives by indolence, and some by over exertion, others are killed by the doctors, while not a few sink into the grave under the effects of vicious and beastly practices. All the medicines in creation are not worth a farthing to a man who is constantly and habitually violating the laws of his own nature. All the medical science in the world cannot save him from a premature grave. With a suicidal course of conduct, he is planting the seeds of decay in his own constitution, and accelerating the destruction of his own life.

ADULTERATION OF GERANIUM OILS.—The author detects fatty oils, gum resins, and other liquid hydrocarbons as follows: Into a test glass are poured 5 c.c. alcohol at 70 per cent, and 6 drops of the oil in question, and the whole is well shaken up. If the oil is pure it remains bright and clear, while sophisticated specimens turn milky. This process is of course not available for the detection of cheaper ethereal oils.—*M. Jaillard, in Wochenschrift Oel und Fett Handel.*

Remarkable Snow Storms in India.

Some interesting details of the extraordinary snowfall in Cashmere in 1877-78 are given in a paper in the just issued number of the Journal of the Asiatic Society of Bengal by Mr. Lydekker. Early in the month of October, 1877, snow commenced to fall in the valley and mountains of Cashmere, and from that time up to May, 1878, there seems to have been an almost incessant snowfall in the higher mountains and valleys; indeed, in places it frequently snowed without intermission for upwards of ten days at a time. At Dras, which has an elevation of 10,000 feet, Mr. Lydekker estimated the snowfall from the native account, as having been from 30 feet to 40 feet thick. The effects of this enormous snowfall were to be seen throughout the country. At Dras the well built travelers' bungalow, which had stood some thirty years, was entirely crushed down by the weight of the snow which fell upon it. In almost every village of the neighboring mountains more or less of the log houses had likewise fallen, while at Gulmarg and Sonamarg, where no attempt was made to remove the snow, almost all the huts of the European visitors were utterly broken down by it. In the higher mountains whole hillsides have been denuded of vegetation and soil by the enormous avalanches which swept down them, leaving vast gaps in the primeval forests and choking the valleys below with the *débris* of rocks and trees. As an instance of the amount of snow which must have fallen in the higher levels, Mr. Lydekker mentions the Zogi Pass, leading from Cashmere to Dras, which has an elevation of 11,300 feet. He crossed this early in August last year, and he then found that the whole of the ravine leading up to the pass from the Cashmere side was still filled with snow, which he estimated in places to be at least 150 feet thick. In ordinary seasons this road in the Zogi Pass is clear from snow some time during the month of June. As another instance of the great snowfall, Mr. Lydekker takes the valley leading from the town of Dras up to the pass separating that place from the valley of the Kishengunga River. About the middle of August almost the whole of the first mentioned valley, at an elevation of 12,000 feet, was completely choked with snow, which in places was at least 200 feet thick. In the same district all passes over 13,000 feet were still deep in snow at the same season of the year. Mr. Lydekker gives other instances of snow lying in places in September, where no snow had ever before been observed after June. As to the destruction of animal life, in the Upper Wardwan Valley large numbers of ibex were seen embedded in snow; in one place upwards of 60 heads were counted, and in another not less than 100. The most convincing proof, however, of the havoc caused among the wild animals by the great snowfall is the fact that scarcely any ibex were seen during last summer in those portions of the Wardwan and Tilail Valleys which are ordinarily considered as sure finds. So also the red bear and the marmot were far less numerous than usual. Mr. Lydekker estimates that the destruction to animal life caused by the snow has far exceeded any slaughter which could be inflicted by sportsmen during a period of at least five or six years.

Women and Girls in English Mines.

It is a somewhat startling fact that there are still nearly 5,000 women and girls employed about the coal mines of Great Britain. In the official summary of persons employed in and about the mines, under the Coal Mines Act, it is stated that 21 females under the age of 13 years are employed. Of girls between the ages of 13 and 16 there are 433 employed; of young women above the age of 16 there are no less than 4,502 employed. In the mines registered under the Metalliferous Mines Act there is a larger proportionate employment of females. At the tender age of between 8 and 13 years, there are 96 girls employed, chiefly in the Cornwall district; between the ages of 13 and 18, there are 981 girls employed above these mines, Cornwall and the North Wales district employing the bulk; and there are also 1,741 females above the age of 18 employed, Cornwall, North Wales, and Ireland employing all these except 20; and of this score, somewhat singularly, the chief part are employed in the North of England, which has been remarkably free from women's work in the unfit employment of mining. The proportion of women employed is said to be decreasing; but the fact that girls of such tender ages are put to mining operations, or to work "above ground" at the mines, is a sign that the unsatisfactory symptom is not likely to entirely die out.

The Deepest Well in the World.

The sinking of the deep artesian well near Buda Pesth, Hungary, is now completed; the works were commenced as far back as 1868, and during their progress many interesting facts relating to geology and underground temperature have been brought to light. The total depth is 3,200 feet, and the temperature of the water it yields is nearly 165° Fahr. The temperature of the mud brought up by the borer was taken every day, and was found to increase rapidly, in spite of the loss of heat during its ascent, down to a depth of 2,300 to 2,700 feet. Beyond this point the increase was not so marked. At a depth of 3,000 feet the temperature was 177° Fahr., giving an average increase of 1 for every 23 feet bored. Water first commenced to well up at a depth of 3,070 feet; here its temperature was 110° Fahr., and from this point onward it rapidly increased both in quantity and temperature. Thus, at 3,092 feet, its temperature had already risen to 150° Fahr., and the yield in 24 hours from 9,500 to 44,000 gallons. Finally, when the boring had reached 3,200 feet, at which point it was stopped, the temperature of the water, as it burst from the orifice of the tube, was 165° Fahr., and the volumetric yield 272,000 gallons in the 24 hours. This yield was afterward reduced to 167,200 gallons, in consequence of the bore being lined with wooden tubes, which reduced its diameter. The water obtained disengages carbonic acid in abundance, and also contains nitrogen and a little sulphureted hydrogen, and 80 grains per gallon of fixed matters, chiefly sulphates and carbonates of potash, soda, lime, and magnesia.

Ocean Telegraph Cables.

In a recent lecture by Mr. Wm. H. Preece, he says: The deep sea portion of the Cape cable, while it differs to a certain extent from the Atlantic types, is still deficient in that absolute durability which all cables ought to have. In fact there is room for invention in this direction. Generally, one notices that, where there is a want, some one will spring up with an invention to meet that want. Here is a want that has existed for many years, but no one has invented a cable which can be said to be perfectly adapted for its purposes; so that, if any one here is of an inventive turn, let me recommend him to try his hand at inventing a cable which will give us all the requirements needed.

This cable to the Cape has one peculiarity in which it differs from any others. Now, among the various accidents to which cables are subject, there is one due to the existence of life at the bottom of the sea. We know that in different seas there are certain little insects, sometimes *Teredos*, sometimes *Xylophaga*, sometimes *Limnoria*, and others of very hard names, which have a peculiar liking for gutta percha. These little *teredos* attack us on sea as well as on land, and the trouble they cause us is sometimes immense. We suffer from them very much on the Irish coast, where the little wretches have found their way to the gutta percha, and have there scored and figured it in a very curious way, samples of which you will see on the table.

To put a check to their boring instinct, the Telegraph Construction and Maintenance Company, who made the cable which is being laid to the Cape, but which was originally intended for Australia, have surrounded the gutta percha with a wrapping of brass; and if any of these boring insects abound in any portion of the line where this brass wrapping is used, I have no doubt that the brass will be too much for them, and that they will find themselves terribly beaten in making any attempts to get at the gutta percha.

It is found that these little animals do not exist at greater depths than 100 fathoms, and, therefore, in the deep sea portion of this cable the brass wrapping will not be found.

There are a great many accidents to which submarine cables are subject. One of the principal is that of a ship's anchor, and it was the disturbing element of a ship's anchor that prevented me from having the pleasure of being before you last Monday. On the table is a piece of cable which has been taken out of that crossing the River Humber. The cable which crosses this river is one of the most important that we possess, and for that reason one of the strongest kind of cable ever made was laid down. In the Postal Telegraph Department we have no less than 62 cables, and their aggregate length of 1,224 miles contains a total of 3,809 miles of wire. To cross rapid streams and important rivers strong cables are used, and to cross the Humber, which during spring tides runs at the rate of six to seven knots an hour, a cable of the strongest type was used; yet it had not been down six weeks when a ship got hold of it, and the cable was caught by its anchor. The heavily laden schooner riding on a strong tide, with its anchor attached to the cable, brought to bear an enormous force, and, perhaps owing to the construction of the cable, this force would not be equally divided among the outside protecting wires, and thus one wire, bearing the greater strain, gave way, followed by the snapping of a second, and so on till the whole cable was severed in the straggling and tangled manner that you see, which is very different from its symmetrical form when first laid. This break occurred in a very nasty stream, where the cable was so buried in mud that I could not find it; and I was despairing of being able to give even a second lecture here, when a happy thought occurred to me. I had spent a whole day in grappling after this cable, trying over and over again, and yet never getting near it, when it suddenly came into my mind that Shakespeare makes Bassanio say: "In my school days, when I had lost one shaft, I shot his fellow of the self-same flight, the self-same way, with more advised watch, to find the other forth; and, by adventuring both, I oft found both." So, knowing that a ship had dropped its anchor over the cable, I thought we would drop our anchor too, and we did, and waited a whole tide, and when we hauled the anchor up there was the cable.

The chief cause of accidents to cables, next to that of anchors, is probably due to abrasion of the cables on rocky bottoms. The bottom of the sea is frequently of an undulatory nature, and the cable remains suspended from point to point, and at such points the wire becomes chafed and worn away, and speedily decays. I am sorry to see that the time at my disposal has gone so rapidly that I cannot particularize to you many of the different causes that lead to the destruction of cables, not only abrasion, not only accidents in paying out, but accidents that exist afterward; for instance, a whale once caught a cable in the Persian Gulf and broke it; a shark's tooth has been found embedded in a cable, and a sinking ship has caused damage to a cable.

Sometimes the cables rest on corrosive stones, copper ores, and ironstone, when corrosion sets in and causes the cable to speedily fail. Volcanic action sometimes damages cables, as also rock slips. In the Bay of Biscay, which is crossed by the Direct Spanish Company's cable, there is no doubt that such a cause has interfered with the cable on two occasions, curiously enough, interrupting the wire each time on the same day of the year. There is a peculiar shelving of the rock, and slips exactly equivalent to our landslips take place at intervals.

Icebergs, too, from the North Atlantic, frequently carry large pieces of rock, which fall to the bottom when the iceberg thaws, and in their descent are liable to fall across a cable and damage it.

There are also faults due to imperfect joints, due to accidents that pass inspection during the process of manufacture, but which slowly develop themselves after submersion or lapse of time.

Lightning, earth currents, and things of that kind affect cables, but, nevertheless, the eye of the telegraph engineer is constantly watching these circumstances as they happen, and he tries to bring to bear upon them all the power and thought he possesses; and the result is that, by slow experience, the cable of the present day is very superior to that used in the early days, and the improvement has been equal to the advance, which, I hope I have been able to show you, has been made as regards the insulators and iron wire.

ENGINEERING INVENTIONS.

Mr. Alexander T. Wilson, of Fairfield, Ill., has patented a cheap and simple device for securing and connecting the ends of rails, by the use of which fish plates and nuts and bolts may be dispensed with, and the necessity of punching holes in the rails be obviated. It consists, essentially, of a doubly slotted block of iron or steel, the top of which conforms to the thread of a rail, and whose bottom is flush with the foot of the rail, and which may be set between the rail, so that their ends may be fixed in the slots and held fast.

Mr. Felix S. Prendergast, of Savannah, Ga., has patented an improved gauge for determining the distance apart of the rails of a railroad track. It is so constructed as to give the correct gauge distance, even when the gauge board may not be at right angles with the rails. It consists in a track gauge formed of a gauge board having a segment of a circle attached to it near one end, and a segment of a circle or equivalent knife edge attached to it near the other end.

Mr. Cornelius R. Van Ruyven, of Deventer, Netherlands, has patented a simple and efficient apparatus for regulating and correcting the position of switches, the apparatus being under the control of the engine driver, so that should the switch stand wrong it can be shifted from the engine. This invention is an improvement in the class of switches whose operation is controlled by the engineer or engine driver, the movable rails being shifted or adjusted in position by means of devices on the locomotive.

An improved machine for opening ditches to receive tiles has been patented by Mr. Guernsey Smith, of Rochester, Ill. It is simple in construction, convenient, reliable, and will remove the soil and deposit it at the side of the ditch, and leave the ditch in proper condition to receive the tiles.

The Immensity of the Stars.

We take from *Le Monde de la Science* the following interesting "Considerations on the Stars," by Professor J. Vinot: "It is known that the stars are true suns, that some of them are larger than our own sun, and that around these enormous centers of heat and light revolve planets on which life certainly exists. Our sun is distant from us 38,000,000 leagues, but these stars are distant at least 500,000 times as far—a distance that in fact is incommensurable and unimaginable for us. Viewed with the unaided eye the stars and the planets look alike; that is, appear to have the same diameter. But, viewed through the telescope, while the planets are seen to possess clearly appreciable diameters, the stars are still only mere luminous points. The most powerful of existing telescopes, that of Melbourne, which magnifies 8,000 times, gives us an image of one of our planets possessing an apparent diameter of several degrees. Jupiter, for instance, which, seen with the naked eye, appears as a star of the first magnitude, with a diameter of 45" at the most, will in this telescope have its diameter multiplied 8,000 times, and will be seen as if it occupied in the heavens an angle of 100°. Meanwhile a star alongside of Jupiter, and which to the eye is as bright as that planet, will still be a simple dimensionless point. Nevertheless that star is thousands of times more voluminous than the planet!

"Divide the distance between us and a planet by 8,000, and you have for result a distance relatively very small; but divide by 8,000 the enormous number of leagues which represents the distance of a star, and there still remain a number of leagues too great to permit of the stars being seen by us in a perceptible form. In considering Jupiter, or any of the planets, we are filled with wonder at the thought that this little luminous point might hide not only all the visible stars, but a number 5,000 fold greater—for of stars visible to our eyes there are only about 5,000. All the stars of these many constellations, as the Great Bear, Cassiopeia, Orion, Andromeda, all the stars of the zodiac, even all the stars which are visible only from the earth's southern hemisphere, might be set in one plane, side by side, with no one overlapping another, even without the slightest contact between star and star, and yet they would occupy so small a space that, were it to be multiplied 5,000 fold, that space would be entirely covered by the disk of Jupiter, albeit that disk to us seems to be an inappreciable point."

Business and Personal.

NEW BOOKS AND PUBLICATIONS.

AN ILLUSTRATED DICTIONARY OF SCIENTIFIC TERMS. By William Rossiter. New York: G. P. Putnam's Sons. 12mo, pp. 352. Price $1.75.

A handy book of reference, containing some 14,000 scientific terms, many of them not to be found in ordinary dictionaries. The list includes the more important technical and scientific words, and those most commonly used. In all cases the pronunciation is indicated, and usually the derivation. There have been added to the dictionary proper a number of tables of weights and measures, and briefly the nomenclature of botanical, zoological, anthropological, chemical, and geological classification. The illustrations are unimportant.

REPORTS TO THE ST. LOUIS MEDICAL SOCIETY ON YELLOW FEVER. By Wm. Hutson Ford, A.M., M.D. St. Louis: Geo. O. Rumbold & Co. 8vo, pp. 320.

Embraces the report of the committee appointed by the St. Louis Medical Society to inquire into the relations of the epidemic of 1878 to the city of St. Louis, and Dr. Ford's Report on the meteorological conditions and etiology of yellow fever, on the etiology of sunstroke, cholera, and other diseases associated with high temperature, and on the treatment of yellow fever. The volume is well indexed.

THE BUILDING MATERIALS OF OTAGO AND SOUTH NEW ZEALAND GENERALLY. By W. N. Blair. Dunedin, New Zealand: J. Wilkie & Co. pp. 244.

A volume of great local value and of considerable general interest, describing the building stones and roofing slates of New Zealand, their geology and outcroppings; the localities of the clay banks suitable for bricks, etc., and the qualities of such clays; New Zealand limes, cements, and their aggregates; and a very interesting review of the numerous timber trees and woods suitable for builders' use. There is added a section on the metallic products of Otago. The book is well indexed.

ELECTRO METALLURGY, PRACTICALLY TREATED. By Alexander Watt. New York: D. Van Nostrand. pp. 196.

This is the sixth and enlarged edition of Watt's handbook, from the English plates of 1876. A copious index has been added.

A SKETCH OF DICKINSON COLLEGE. By Chas. F. Himes, Ph.D. Harrisburg: Lane S. Hart.

An interesting history of one of the oldest colleges in the United States, neatly printed and illustrated by woodcuts and photographs. A particularly interesting chapter is that tracing the progress in scientific education since the founding of the college in 1783.

SEEING AND THINKING. By William Kingdom Clifford. London: Macmillan & Co. Price $1.

This, the latest volume of the *Nature* Series, includes four lectures by the late professor of applied mathematics and mechanics in University College, London, on the eye and the brain, the eye and seeing, the brain and thinking, and boundaries in general. No one who ever made an acquaintance with Mr. Clifford as a clear thinker and lucid expositor, need be told that, as an example of scientific teaching, this is one of the most valuable books of the series. In the death of Mr. Clifford the scientific world lost the most promising of its rising scholars; for he, more than any other, represented the ideal scientific intellect, at once earnest, fearless, and admirably sincere.

INDEX TO THE LITERATURE OF TITANIUM. 1783 to 1876. By Edward J. Hallock, 8vo, paper. pp. 76. Price 25 cents.

A paper read before the New York Lyceum of Natural History in 1876, and reprinted from the annals of the New York Academy of Sciences. Its plan is the same as that of Dr. Bolton's Indices to the Literature of Uranium and Manganese.

THE HORSE. By B. Pitcher. Second edition. Chicago: published for the author.

A short essay on the breeding, breaking, handling, shoeing, doctoring, and general treatment of the horse, by one who frankly declares himself to be no professor, college graduate, horse doctor, or doctor of any kind; but a humble mechanic. Mr. Pitcher is a practical smith of nearly forty years' experience and observation; and he treats his subject wholly from the practical standpoint. He has added a chapter of advice to young mechanics, in which he shows himself the possessor of no little practical wisdom and an abundance of sterling good sense.

FIRST STEP IN CHEMICAL PRINCIPLES. By Henry Leffmann, M.D. Philadelphia: Edward Stern & Co.

Designed to make clear by explanation and illustration those points in chemical theory, notation, and nomenclature which give trouble to beginners. Dr. Leffmann is the lecturer on toxicology at Jefferson Medical College, and his little handbook contains the substance of the lectures to the quiz classes of that institution.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) C. M. asks for a preparation to prevent nets from rotting in water. My nets are made of American hemp line, about ¼ inch in diameter, and therefore expensive. If I knew of some preparation or waterproof mixture that would prevent the water soaking into them and rotting them, it would be a great saving to me. A. The following treatment is said to preserve nets for a long time in good condition: Soften one lb. good glue in cold water, then dissolve it in ten gallons of hot soft water with one half lb. curd soap. Wash the nets in soft water, then boil them in this for 2 hours, press out excess of the liquid and hang up over night. The second bath consists of alum 2 lb., water, 5 gallons; heat nearly to boiling, and immerse the nets in this for about three hours, then press and transfer to a strong decoction of oak bark or a solution of sumac in warm water (water 5 gallons, sumac 8 lb.) and let them remain immersed in this for 48 hours, or longer, if convenient.

(2) R. G. B. asks for a method for electroplating flowers. A. See pp. 380,(39), 47, and 34, Vol. 35.

(3) L. C. P. asks: 1. What is a good wash (red) for brick pathways? A. Try the following: red ocher, 5 lb.; water glass, ½ lb.; dissolve the latter in boiling water and add the ocher, to form a thin wash. Apply with a stiff brush, preferably while hot. 2. What is a good remedy to destroy ants in pantries, cellars, etc.? A. Try boracic acid powder.

(4) S. A. writes: I light my hotel with vapor of gasoline from a gas machine, and on the third floor and above it the light is much more brilliant and combustion more perfect with the same style of burners. Please explain the cause. A. In a column of air saturated with vapor of naphtha diffusion is never perfect, the heavier hydrocarbons tending to accumulate in the lower portions, and the combustion at these points is incomplete in ordinary burners, owing to the richness of the vapor in hydrocarbons.

(5) P. B. asks for a receipt for making a cheap imitation of mildew bronze. A. Dissolve equal weights of nitrate of iron and hyposulphite of soda in 8 parts of water; immerse the articles in this until of the right tint, then well wash with water, dry, and brush; 1 part chloride of iron and 2 parts water imparts to brass a fine antique green. Brush well and lacquer with pale gold lacquer, or polish with oil.

(6) G. writes: 1. On page 218 you publish an article on making cloth, etc., fireproof; would either the first, second, or third composition also tend to render the fabric mildew-proof; and if so, to what extent? A. Under ordinary circumstances the treatment would prevent mildew. 2. Would frequent wetting and rough usage be apt to wash or shake off the composition? A. Yes.

(7) N. C. M. asks for a recipe for making boots waterproof. A. Linseed oil, 1 part; mutton tallow, ⅛ lb.; beeswax ⅛ lb.; melt and mix thoroughly together, and apply to the warm, dry leather with a brush. A small quantity of ivory black is sometimes added to this mixture.

(8) H. K. & W. M. W. ask (1) for a receipt for a size to mix bronze powder with so that it can be painted on with a brush (on iron gas fixtures, etc.). A. To one pint of methylated finish add 4 oz. of gum shellac and ½ oz. gum benzoin. Put the bottle in a warm place and agitate it occasionally. When the gums are dissolved, let it stand in a cool place 2 or 3 days to settle, pour off the clear portion and reserve for finest work, using the sediment, which by addition of more alcohol, may be made workable, when strained for first coat or coarser work. Add the bronze (*q. s.*) to this, and apply to the clean, smooth, warm iron, using a soft brush. Repeat, after drying, if necessary. Thin with alcohol (if necessary), to avoid wrinkles and brush marks. Varnish over all. 2. How is the glossy black obtained that I have seen on so many nice chandeliers? A. What you refer to is probably enamel or Japanese work.

(9) W. H. F. asks: 1. What kind of paper do stereotypers use for what is known as the paper process of stereotyping? A. First, soft sized cotton tissue paper; second, soft unsized printing paper of not too short fiber; backing, cartridge paper. 2. What is the paste made of that is used in the paper process of stereotyping? A. Good starch paste answers very well. 3. Is there such a machine known as an engraving machine, and by whom manufactured? A. Yes; several of these have been described and illustrated in the back numbers of the SCIENTIFIC AMERICAN. 4. Can terra alba (or white earth) be used in making moulds of plaster of Paris? A. It is occasionally used for fine castings, but not often.

(10) C. A. R. asks: 1. What is the value per ton of chromate of iron ore which assays 40 per cent oxide of chromium, delivered in New York or other Eastern cities? A. About $30 per ton. It would not be profitable to ship such an ore East. 2. Is there any cheap mode of extracting the chrome from the ore, which could be set up at the mine, to save transportation? A. The neutral chromate (yellow) and dichromate (red) of potassium, sodium, or calcium (lime), are the only preparations made direct from the ore. The chrome iron ore, previously pulverized and cleansed, is mixed with carbonate and nitrate of potassa, soda, or lime, as the case may be, and roasted on the hearth of a reverberatory furnace. The sintered mass after cooling is ground up, lixiviated with boiling water, silica, and alumina, precipitated from the solution by addition of wood vinegar (pyroligneous acid), and the clear liquid drawn off and evaporated until a film of saline material begins to form on the surface, when it is left to crystallize. From these crystals (yellow or neutral chromate of potassa or sodium), potassium (or sodium) dichromate is prepared by the addition to their solution of sulphuric or nitric acid; the dichromate crystallizes out on concentrating and cooling the solution.

(11) E. P. S. asks: Are there southern lights at the south pole, as there are northern lights at the north pole? A. Yes; Aurora Australis.

(12) C. J. D. asks (1) for a receipt for violin varnish (the best, if you please). A. Coarsely powdered gum copal and glass, each 4 oz.; alcohol, 64 o. p., 1 pint; camphor, ½ oz.; heat in a water bath with frequent stirring, so that the bubbles may be counted as they rise until solution is complete, and when cold decant the clear portion. When oil varnish is used it is made from artists' vinegar copal. 2. Receipts for stains for violins? A. To darken the wood rub over it nitric acid, specific gravity 1·2, and, after standing twelve hours, wash and dry thoroughly. Then use either of the following: First, prepare a groundwork with strong hot aqueous solution of logwood extract; then apply a solution of 3 oz. potash, 3 oz. red sanders; 2½ lb. gum shellac, and 1 gallon water, dissolved over a quick fire. 2. Boil 1 oz. logwood extract in 1 pint water (soft), and add 1-5 oz. cream of tartar. Use the stain hot, and give several coats, if necessary, drying between each. Use a "saw-edged" graining brush and asphaltum varnish, sufficiently thinned, to produce the proper markings.

(13) E. L. writes: We have tried a good many times, but without success, to melt the following metals, namely, ¼ oz. brass, 3 oz. pure silver, 1 oz. bismuth, 2 oz. common salt, 1 oz. of arsenic, and 1 oz. of potash. You will please let us know through your SCIENTIFIC AMERICAN what kind of crucible to be used, what kind of fire, whether it should all be put in the crucible at once, how to melt it, and when melted, whether to use plaster of Paris or brass moulds? A. You can use a French clay melting pot (crucible). Melt the brass and silver first under a layer of charcoal, then add your fluxes and finally the bismuth and arsenic wrapped in paper; after which pour as soon as possible, with care to avoid inhaling the poisonous arsenical fumes. With good management a four ounce charge may be fused in a good ordinary stove. For larger charges a regular crucible furnace will be required. You can mould in plaster of Paris. See "Hints to correspondents," above.

(14) S. A. F.—The following is a good composition for blackboards: Shellac, 6 oz.; alcohol, 1½ pints; warm the latter and digest in it the shellac until solution is effected. Then strain through a cloth, filter, and introduce about 5 ounces of a mixture of equal parts bone black (floured) and emery flour, stirring until a uniform distribution of these is secured. The mixture should have the consistency of very thin sirup. Thin with more alcohol, if necessary, and apply two coats, using a soft smooth edged brush.

(15) H. M. Co. ask: How can we in an inexpensive manner get the tin, solder, and dirt off old copper bottoms so as to make them clean? A. Cleanse first in a boiling solution of 3 parts caustic soda, 1 part niter, and 5 parts water, and then in dilute sulphuric acid; or dip momentarily in warm nitric acid, specific gravity 1·2, and wash immediately in running water.

(16) H. L. W. asks: To what extent is air compressible? Or what is the limit of the compressibility of air? A. We do not know that the limit of compressibility has ever yet been ascertained.

(17) C. K. asks: Which chain has the most strength, one with ⅜ twist links, or one with ⅜ straight links? A. One with straight links, because the stress is in the direct line of the link, which is not the case with the twisted link.

(18) C. N. K. asks if there is any way of finding the number of pounds of coal that is necessary to run 1 horse power when you have the following given: 1. The sum of the horse power of each machine. 2. The number of hours that each machine has run. 3. The total number of pounds of coal consumed. Is there any different way of arriving at the same thing? My object is to find out, after using several kinds of coal, which is the cheapest. A. 1 horse power has been produced by the combustion of 2 lb. of coal per hour; on the other hand, with badly designed engines and boilers, 8 or 9 lb. of coal per hour have been consumed to produce the same result; the quality of the coal affects the economy. The only way to get at the result you wish, is to weigh the coal consumed in a given time, and measure the water evaporated.

(19) W. H. G. asks how a cord of 4 foot wood should be piled up. One says that the sticks should be laid straight, with the bark side down, when they have bark only on one side; another, that it should be laid straight, rather carelessly, the pile to be 4 feet high and 8 feet wide; while a third claims that in New York and Philadelphia the practice is 128 cubic feet solid timber, arrived at by water displacement. A. 128 cubic feet as piled is one cord. The seller wishes to pile as open as possible, by so piling as to have the angles come in contact; the buyer, on the contrary, wishes to pile as close as possible, by fitting the angles into each other.

(20) W. H. B. asks: Which quality of iron, hard, coarse, and granular, or fine, soft, and close grained, will best stand the heat of anthracite coal under steam boilers, grate use? A. We think a mottled gray iron with large crystals is the best for the purpose.

(21) E. S. F. asks if a boiler 16 inches diameter, 4 feet high, with the sides and ends of wrought iron 3-16 of an inch thick, will hold 50 lb. pressure with perfect safety. A. 3-16 will do for the sides, but the ends, if made 3-16, should have a brace tying the two ends together.

(22) W. T. writes: 1. I have an upright engine of six inch bore and 12 inch stroke (6 inch by 12 inch), ports 3½ inch by ¼ inch, exhaust 3½ inch by 1 inch. I am told that it is designed to run at 100 to 125 turns per minute. Now with this engine how can I run a boat about 32 feet long, of less than 5 tons measurement (500 cubic feet), with side wheels, stern wheel, or propeller, using steam at 100 to 125 lb. in boiler, no cut-off, at the rate of 10 miles per hour for a several hours' trip? A. You can do it by using a propeller, if you have ample boiler. 2. Is there any kind of side wheels that could be run advantageously at 125 turns per minute? A. No. 3. Is it practicable to run such a boat, weighing with contents 4 tons, with such an engine, with side wheels, at ten miles per hour? A. No. 4. Would friction pulleys work as well as gearing? A. You need no gearing for a propeller.

(23) W. W. writes: I have a small boiler, 5 feet in length and 18 inches diameter, with 18 one-inch tubes. I have laid it down, and the fire box, of brick, is 9 by 18 inches, and the bridge wall is 3 inches from the boiler, and is continued that way all the way to the end of the boiler, where a space of 9 inches is left. The space under the grate is 1 foot, and the smoke pipe is 8 inches. The fire goes under the boiler and returns through the tubes. I have put the exhaust into the pipe, but can get no draught. What is the trouble? A. The trouble is in the small area of the tubes; set your grate out in front of the boiler, with 2½ inches depth of flue under the boiler; let the fire pass both through the tubes and under the boiler direct to the chimney.

(24) F. W. R. asks how to obtain a column of air having a velocity of twenty-five thousand feet per minute (25,000 feet); the opening or nozzle to be one inch. Could I use an air pump, forcing the air into a chest or box, and then use at will, from one inch openings? A. The only way is to compress the air by an air pump to the pressure necessary to give the required velocity.

(25) J. D. R. asks how to make a paint or blacking for a boiler. The boiler is in the house, and something that makes as little smell and smoke as possible, is desirable. A. Use asphaltum varnish. There is little or no odor from it when dry.

(26) J. C. asks: On an engine with cylinder 5 inches diameter and 4 inch stroke, running at 200 revolutions per minute, with an average steam pressure of 50 lb. per square inch, what size pulley should be used to drive woodworking machinery, said pulley to be used both as pulley and balance wheel? A. Probably a pulley 4½ inch face; the diameter must be determined by the speed required for your line shaft.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

October 21, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Areator and refrigerator for beer and other liquids, C. P. Blatt	220,795
Agate and other stones, bleaching, coloring, and ornamenting, A. Dreher	220,708
Aluminous cake, making, F. Laur	220,720
Anvil and vise, combined, G. B. St. John	220,896
Axle box, car, T. A. Bissell (r)	8,940
Bale tie, W. H. Roane	220,869
Baling press, Cagle & Nichols	220,802
Baling press, W. L. Morris	220,859
Beehive, D. P. Bower	220,747
Beer, apparatus for filling out, J. & J. Stuber	220,898
Beer, extracting malt in making, J. A. Schaefer	220,875
Blasting squib, Thomas & Powell	220,735
Boat lowering apparatus, H. Bruns	220,798
Boot and shoe button hole, B. L. Newhall	220,860
Boot and shoe former, Walker & McIntyre	220,750
Boot and shoe sole edge finisher, E. Humphrey	220,841
Boot, rubber, G. Watkinson	220,778
Bootee, J. F. Emerson	220,710
Bracket, J. J. Read	220,870
Bung and bushing, J. A. Rutschman	220,871
Bung and stopper for casks, W. H. Stewart	220,773
Button, dress, R. E. Brookes	220,697
Can cover, J. H. Hettinger	220,835
Candlestick, A. J. Smith	220,879
Car coupling, Bradley & Sherratt	220,797
Car coupling, Cook & Leas	220,809
Car coupling, F. C. Doolittle	220,814
Car coupling, S. Garrett	220,713
Car coupling, Harlin & Byram	220,830
Car coupling, J. H. Horton	220,716
Car coupling, P. Y. Kepler	220,719
Car warmer, street, I. S. Justh	220,718
Car window, W. J. Hall	220,758
Carburetor, J. H. Bean	220,695
Carding machine, T. Kershaw	220,906
Carriage springs, machine for forming the eyes of, J. Evans	220,711
Carriages, reversible handle for childrens', F. Meinecke	220,721
Cartridge capping and uncapping implement, G. L. Bailey	220,743
Cartridge turning implement, W. G. Rawbone	220,771
Catarrh remedy, H. E. Bissell	220,794
Centrifugal machine, Gaunt & Poles	220,824
Churn, S. Collins	220,750
Clay or cement to make the joints of stoves and fireplaces, fire, J. Hinklein	220,715
Clock and watch, J. A. Miller	220,724
Clothes line reel, P. E. Bird	220,793
Clothes wringer, G. S. Foos	220,821
Coffee and rice huller, C. B. Brown	220,698
Coffee pot, J. D. Adney	220,691
Coin holder, L. H. Olmstead	220,770
Collar and hame attachment, A. Carlin	220,804
Concrete pipe, apparatus for making and laying continuous, Hamilton & Earl	220,757
Copper lined boiler, W. L. Brownell	220,748
Corn stub cutter and splitter, S. Sherman	220,877
Corset, abdominal, J. C. Cook	220,806
Cotton gin, J. F. Means	220,854
Cotton gin, F. E. Smith	220,880
Cotton scraper, L. W. Carraway	220,700
Cradle, platform, F. Mohr	220,857
Cupel furnace, S. G. Wight	220,895
Curtain fixture, J. W. Core	220,807
Curtain roller and bracket, Barrett & Knapp	220,787
Curtain roller, spring, T. Barrett	220,786
Dental engine, J. Heron	220,834
Door brace, J. Louprette	220,852
Dredge winder, C. C. Green	220,827
Electric recorder, F. A. Dowd	220,752
Elevator, P. Hinkle	220,738
Elevators, governor and safety appliance for, G. Dryden	220,709
Eyeglasses, nose clamp for, F. Perrin	220,864
Fence, barbed wire, J. H. Weaver	220,740
Fence, rail, B. A. Welds	220,892
Fence, wire, L. W. Bosart	220,746
Fire alarm telegraph box, non-interfering, A. W. Gray	220,754
Firearm lock, A. E. Barthel	220,785
Firearm, magazine, Sweeney & Wetmore	220,734
Fire escape, O. H. Curtis	220,708
Fire extinguisher, automatic, E. Leonard	220,764
Fireplace, open, E. A. Jackson	220,843
Fishing reel, S. W. Wardwell, Jr.	220,776
Furnace feeder, automatic, Dillon & Scully	220,901
Fuse for shells, time and distance, H. Berdan	220,792
Garter, W. W. Anderson	220,692
Gas burner, O. Tirrill	220,736
Gas lighting device, electric, W. C. Cutler	220,704
Gilder's press, J. T. Shepperd	220,875
Glassware, manufacture of, H. Franz	220,822
Governor and speed regulator, engine, J. Reid	220,867
Governor, steam engine, A. Lawrence (r)	8,937
Grain meter, J. Nurnberger	220,861
Grater and cutter, vegetable, W. Mild	220,723
Grave shield and body protector, S. S. Smick (r)	8,941
Harness pad, adjustable, J. Johnson	220,846
Harvester pitman, D. S. Blue	220,696
Hat finishing machine, J. Surerus	220,774
Hat pouncing machine, E. B. Taylor	220,889
Hatsweat, Baker & Van Gelder	220,744
Hitching device, safety, J. A. Fife	220,820
Horse litter, C. V. Pettey	220,865
Ink well, J. D. Williams	220,742
Ironing machine, J. Reidy	220,868
Kitchen boiler, L. S. White	220,782
Kneader, dough, O. W. Robins	220,731
Lamp, Barnard & Hanna	220,788
Lamp, E. S. Drake	220,706, 220,707
Lamp, J. P. Smithers	220,881
Lamp, C. F. Spencer	220,884
Lamp burner, G. K. Osborn	220,725
Lamp, electric, D. Pendleton	220,728
Lard cooler, P. Cudahy	220,811
Lead pigments, making, Lewis & Bartlett (r)	8,943
Letter and character, mica, F. Holthausen	220,903
Letters, making partly transparent, F. Holthausen	220,904
Lifting jack, A. N. Woodard	220,897
Malt extract, producing, G. A. Gessner	220,825
Mangle, C. Reese	220,866
Match, friction, W. T. Mersereau	220,722
Measure, scale, J. M. Gaskins	220,823
Metal trap, soft, J. McCloskey	220,767
Mining drill, F. B. Parrish	220,863
Mirror, folding, N. F. McEvoy	220,853
Miter box, Rogers & Goodell	220,732
Mower, F. Bramer	220,796
Mower, W. F. Rundell	220,870
Mower, lawn edge, T. Hanley	220,829
Ore separator or concentrator, W. L. Imlay	220,842
Organs, pneumatic action for, J. E. Treat	220,737
Oven, baker's, E. B. Cassidy	220,898
Ox shoe blank bar, J. Deeble	220,813
Packing, piston, C. W. Baldwin	220,784
Pantaloons and other garments, E. Spies	220,885
Paper bag machine, W. C. Cross	220,810
Paper cutting machine, lever, E. L. Miller	220,856
Paper folding machine, W. Scott	220,873
Paper stock, reducing wood to, Cornell & Tollner	220,808
Pavement, wood, W. H. Stow	220,887
Paving block, Anderson & Greenawalt	220,698
Pea sheller, J. & S. W. Budd	220,800
Pen, perforating, Baird & Macy	220,783
Pepsin, preparation of, W. H. Bail	220,745
Photographing embossing press, N. Weston	220,780
Pitman connection, S. Shiflett	220,878
Plaiting machine, C. T. Laur	220,850
Plated ware ornamenting tool, H. W. Hirschfeld	220,759
Plow, riding, A. Belchambers	220,790
Plow, sulky, P. L. Case	220,701
Pocket knife, C. L. Butler	220,699
Printing machine, chromatic, G. W. Woodside (r)	8,939
Pump, J. & R. Bean	220,789
Pump, D. C. Montgomery	220,858
Pump, hydraulic air, G. K. Osborn	220,726
Pumps, safety device for steam, N. W. Dunlap	220,753
Rocking chair, J. Loch	220,851
Rolling iron, Eynon & Lloyd	220,818
Rolling pin, P. Cromer	220,732
Root cutting machine, J. W. Weymouth	220,894
Sash fastener, J. L. Wayne, Jr.	220,891
Sash stop and lock, Crosby & Thompson	220,809
Saw clamp, M. J. Barrow	220,694
Saw, scroll, C. A. Dearborn	220,705
Scraper, walking, G. J. Weber	220,741
Seed drill, R. B. Sheldon (r)	8,938
Seed package, C. O. Wolferts	220,896
Sewing machine, hand power attachment for, A. B. Felt	220,819
Sewing machine, needle guard, A. Wemple	220,779
Sewing machine shuttle, W. T. Elliott	220,816
Sheet metal coating apparatus, E. Morewood	220,769
Shirt, G. Churchill	220,805
Shovel, C. W. Hubbard	220,760
Signal box, non-interfering, A. W. Gray	220,755
Skiving machine, C. E. Langmaid	220,847
Slate, hinged, R. S. Barnum (r)	8,936
Smoke and cinder conveyer, A. Heine	220,832
Snow plow, J. M. Baldwin (r)	8,944
Snow plow, A. Day	220,812
Spark arrester, Byram & Hansford	220,801
Speculum and electric light, S. Huffman	220,762
Spice package and pastry utensil, combined, R. S. West	220,781
Spinning rope yarn, etc., machine for, O. Sheehan	220,876
Steam generator, J. Everding	220,712
Steam or water engine, A. G. Waterhouse	220,777
Steamer, feed, H. S. Groves	220,828
Stove door, illuminated, J. Jewett	220,845
Stove, gas, C. Hoffmann	220,838
Stove, oil, J. A. Frey	220,902
Strap protector and buckle, T. Padgitt	220,862
Stud for boots and shoes, G. H. Ellis	220,817
Stump extractor, Courtney & Foster	220,900
Telegraph and fire alarm signal apparatus, A. C. & A. H. Palmer	220,727
Telegraph, underground, C. Linford	220,765
Telephone, A. C. Hubbard	220,83
Telephone case, G. M. Phelps	220,729
Telephone circuit, A. G. Bell	220,791
Telephone, electric speaking, F. P. Mills	220,855
Telephone exchange system and device, F. Shaw	220,874
Telephone signal, F. A. Gower	220,826
Telephone switch, H. A. House	220,717
Ticket or tag, pin, E. A. G. Roulstone	220,772
Tile, drain, A. Campbell	220,749
Time keepers, escapement for, J. J. Johnston	220,763
Time pieces, escapement for, A. G. Laughlin	220,849
Tin and terne plate, making, E. Morewood	220,768
Tobacco, machine for dressing and finishing fine cut, T. R. Spence	220,883
Trace carrier, J. D. Hobbs	220,837
Trace carrier, G. M. Hubbard	220,761
Treadle, E. T. Thomas	220,890
Trees, roots, etc., compound for destroying, W. T. Buchanan	220,790
Turbine wheel, D. Hubbard	220,840
Tuyere, T. McCaffery	220,766
Vegetable slicer and grater, combined, A. Smith	220,882
Washing machine, J. Carroll	220,808
Washing machine, M. L. Hawks	220,714
Washing machine, A. Walton	220,738
Washing machine, D. Warnock	220,739
Watches, removable potance for, F. A. Earl	220,815
Water elevator, A. C. Jackman	220,844
Water wheel, J. Todd (r)	8,942
Watering stock, device for, Landreth & Garnett	220,848
Weather strip, M. Herrens	220,833
Whiffletree hook, Z. M. Hibbard	220,836
Windmill, Z. & F. M. Cottle	220,751
Woodwork, mosaic, C. H. Westcott	220,893
Wool washing machine, F. G. Sargent	220,733
Zinc furnace, Hegeler & Matthiessen	220,831

TRADE MARKS.

Bate for tanners' use, W. C. Tiffany	7,739
Canned salmon and other fish, W. T. Coleman & Co.	7,745
Cigars, Steinberg Bros. & Co.	7,750
Cigars, E. A. Smith	7,748
Cigars and cigarettes, Fitzpatrick & Draper	7,734
Cigars, cigarettes, and smoking tobacco, L. Simons & Brother	7,738
Cigars, cigarettes, and chewing and smoking tobacco, Ed. Aschermann & Co.	7,747
Cigars, cigarettes, and smoking and chewing tobacco, H. Muller	7,744
Cigars, cigarettes, and smoking and chewing tobacco, H. R. Kelly	7,735, 7,736
Flour, Wilkinson, Gaddis & Co.	7,742
India-rubber boots shoes, and foot coverings, The L. Candee & Co.	7,741
Medical compound, W. McCurdy	7,746
Oil or dressing for harness, shoes, etc., J. T. Vail & Brother	7,743
Plug and fine cut chewing tobacco, Pace, Talbot & Co.	7,737
Smoking and fine cut chewing tobacco, cigars, cigarettes, and snuff, Marburg Brothers	7,740
Whisky, H. W. Smith & Co.	7,749

DESIGNS.

Font of printing types, Bailey & Gilbert	11,470
Knit drawers, Swits Conde	11,462
Lamp brackets, F. R. Seidensticker	11,465, 11,466
Medal batteries, W. M. Elias	11,463
Monuments, J. & J. Pool	11,467 to 11,469
Parlor or heating stove, I. T. Montross	11,464
Scarf pin, W. A. Beatty	11,471

FOR THE WEEK ENDING OCTOBER 14, 1879.

TRADE MARKS.

Beverage termed "homeopathic coffee," The Kaoka Manufacturing Company	7,732
Cigars, cigarettes, plug and other chewing tobacco, and smoking tobacco, W. Duke, Sons & Co.	7,731
Gloves and suspenders, Fisk, Clark & Flagg	7,723
Illuminating oils refined from petroleum, Sone & Fleming Manufacturing Company	7,726 to 7,728
Lager beer, V. Loewer	7,730
Linen thread, Marshall & Co.	7,725
Scarfs or light fabrics for gentleman's wear, Fisk, Clark & Flagg	7,724
Smoking tobacco, J. W. Carroll	7,733
Smoking and chewing tobacco and cigarettes, L. Ginter	7,729

DESIGNS.

Clock cases, Henry J. Davies	11,458
Sad iron stands, U. D. Eddy	11,459
Speaking tubes, W. R. Ostrander	11,460
Scarf pin or similar articles of jewelry, J. L. Remlinger	11,461

English Patents Issued to Americans.

From October 10 to October 14, inclusive.

Bedstead and toilet stand, H. A. J. & E. C. A. Bieckert, New York City.
Churns, E. Rhodes, ——, Illinois.
Grain binder, W. A. Wood, M. and R. M. Co., Hoosick Falls, N. Y.
Handkerchief, etc., Mrs. E. W. M. Cameron et al., Brooklyn, N. Y.
Indicator for steam engines, G. H. Crosby, ——, Mass.
Mining machine, F. M. Lechner, Waynesburg, Ohio.
Nail machinery, D. Armstrong, Chicago, Ill.
Pressure regulator, M. G. Wilder, Brooklyn, N. Y.
Steam generator, C. Ward, Charleston, W. Va.
Tilling apparatus, C. E. Sackett, Matilda Furnace, Pa.